The Sight-Saving Review

Volume XXI Number 4

Winter, 1951

This issue is dedicated to Walter B. Lancaster, M.D.

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Walter B. Lancaster, M.D.—An Appreciation

W. L. Benedict, M.D.

Rochester, Minnesota

IT is highly fitting that we pay tribute to a leader in ophthalmology whose sterling character and unselfish devotion to the advancement of education through clear understanding of the applicability of scientific achievement has inspired his colleagues and students of ophthalmology, and its related fields, since before the turn of the present century.

Walter Brackett Lancaster had a brilliant record as a student. He entered Harvard at the age of seventeen and although handicapped by poor health, which caused him to lose two years of school, he was graduated from the Harvard Medical School in 1889. He immediately proceeded to Europe to continue his studies in Vienna, Edinburgh and London. It was while in Vienna as a pupil of Mauthner that he became deeply interested in refraction, motility and neuro-ophthalmology. In Edinburgh he was a fellow student with Maddox. Upon returning to Boston he gave courses of instruction in refraction in the Boston Polyclinic and shortly thereafter he began teaching physiologic optics in the graduate department of Harvard Medical School.

Except for a few years in military service Dr. Lancaster has been practitioner, teacher and investigator. His writings testify to his wide knowledge of clinical ophthalmology as well as the fundamental subjects of optics and physiology. Almost as soon as he started teaching graduate courses he began writing on the training of ophthalmologists. He encouraged research in vision and established a laboratory in optics which he conducted at his own expense for a number of years. His interest in refraction and disturbances of motility has made him known wherever ophthalmology is taught. His test cards and devices for detection and diagnosis of muscle imbalance are almost universally used in offices and clinics where refraction is done. A pioneer in the field of refraction, a contemporary of Jackson and de Schweinitz, he was influential in directing the study of problems of functional eye care through a storm of theories and impractical shortcut methods of diagnosis and treatment. Well equipped to utilize the mathematical formulas established in geometric physiologic optics, he was not unmindful of the fallibility of attempting to cure squint by the application of glasses alone. He devised surgical operations on the ocular muscles which he followed with orthoptic exercises, and he encouraged the squint patient to use methods of self-training for better seeing.

Dr. Lancaster's influence on improving methods of teaching and on requir-

ing minimum standards for the practice of ophthalmology contributed largely to the formation, in 1915, of the Committee on Examination in Ophthalmology, now the American Board of Ophthalmology. As a member of that committee he drew up the plans for the examination, wrote the syllabus and through the early years of its existence guided the Board in applying the new-found process of evaluating the training of practicing ophthalmologists. If there was to be a screening body for the certification of ophthalmologists some uniformity of curriculum was necessary. Teaching had to be brought up to a standard deemed satisfactory to the board of examiners, and such standards had not been established. Graduate training in ophthalmology, as well as in other medical specialties, had been largely a European monopoly. The courses offered in American clinics and hospitals were designed for clinical practice and little time was allotted for the laboratory. The first examinations given by the committee were clinical or practical, and were designed to determine whether the applicant was sufficiently versed in the best practices of ophthalmology to be certified by his colleagues as able to practice the specialty without supervision. The fundamental sciences, which have become so important in present-day practice, were not taught in many institutions where residents were trained, but the need of instruction in basic courses was pointed out by Dr. Lancaster from the beginning, and gradually the need is being met.

Through the leadership of the Board there has been an expansion of graduate teaching of ophthalmology in medical schools and hospitals throughout the country. As a result, in addition to practical work in the clinics, courses are now available in optics and in bacteriology, pathology and biochemistry as applied to ophthalmology, and candidates from all parts of the country and from all schools are given the same tests and graded on a single standard of achievement.

The aims and purposes of the Boards as they are operated today are not seriously challenged. The certificate is accepted as an endorsement of professional proficiency and carries with it the implication of adequate training in the clinical application of scientific discoveries. The standardization of the curriculum in graduate ophthalmology is largely the result of the syllabus adopted by the Board and the time limit prescribed for preparation. The importance of basic courses is not overemphasized but balanced with the significance of the subject in diagnosis and treatment of diseases of the eye. The full development of the function of the Board has occurred within the teaching experience of many who are still actively engaged in practice. The improvement in educational methods and in the quality of instruction is the result of hundreds of students and teachers working harmoniously under the guiding influence of a certifying board. Whether this great forward step in medical training was foreseen by Dr. Lancaster is a question which he may not answer, but that he did anticipate some such reaction to his suggestions for improvement in training methods is seen in his papers published only two or three years before the formation of the Committee on Examination in Ophthalmology. Dr. Lancaster has undoubtedly been the guiding influence on the Board since

its inception and still, as a consultant, participates in all of its activities. To him more than to any other individual is due the credit for stabilizing the value of instruction in basic subjects and the balancing of basic and clinical courses in graduate teaching of ophthalmology. We should probably look upon that as his greatest achievement.

In the clinical field he has practiced and taught the surgical procedures that bear his name, principally the modification of the magnet for extraction of foreign bodies and a method of cataract extraction. His procedures were always sound and practical—the result of the experience of a surgeon endowed with rare skill whose highest aim was to give better service to the sick.

As a humanitarian, Dr. Lancaster has shown the same serious and sincere application which marks his professional life. His affiliation with the National Society for the Prevention of Blindness began in 1933 when he was invited to serve on the Advisory Committee. Two years later he was elected a member of the Board of Directors. He has brought and continues to bring to this post understanding, mental and spiritual vigor, and a genuine willingness to serve, which the Society counts among its priceless assets.

Dr. Lancaster is characteristically a self-critic. It is no digression from his customary way of life to preach the precision which he practices. He is a disciplinarian who is tolerant of the frailties of others but never deviates from the exactitudes he has set for himself. He can admonish without scolding, guide without pointing, differ without arguing, and encourage by example. With an understanding of the elementary truth of a problem, he is content to let those who are qualified apply the practice of scientific achievement where they can truly be of help in the broad field of health and medical care. His humanitarian interests are free from classical restrictions of social, religious and political fraternities. He properly and with becoming modesty occupies a seat among the outstanding men in medicine.

As we go to press we are grieved to learn of the sudden death of Dr. Lancaster in Boston, on December 9, 1951.

Color Vision Testing

Le Grand H. Hardy, M.D., *Director*
Knapp Memorial Laboratories for Physiological Optics
Institute of Ophthalmology, New York, N. Y.

PRESENTS basis, importance, and practical utilization of color vision tests.

COLOR vision is a physiological-perceptual process exhibiting an almost continuous series of variations between very superior discrimination and almost total absence of any discrimination. The theoretical basis and mechanism of the process have never adequately been explained although hundreds of attempts to do so have been made. Nevertheless a practical, satisfactory working hypothesis (the Young-Helmholtz Theory) has supplied the means for a critical evaluation of the process in any given individual and has resulted in the formulation of specifications for a so-called Standard Observer, a physiological abstraction, by means of which conditions for actual human performance may with high precision be described, specified and appraised.

Color mixture and hue discrimination data can be used to classify the color-discrimination abilities of the human population of the world into two great groups: those with normal and those with defective color discrimination; and further to subdivide these groups into as many grades as desired.

A large part of the human population (about 95 per cent) possessing normal color vision is constantly utilizing this faculty for color discrimination in all walks of life. Within this group there are large variations—and those exhibiting superior abilities can, by Color Vision Aptitude Tests, be classified for special services in many areas of industry, science, and art.

About 5 per cent of the total population (8 per cent of males and 0.5 per cent of females) can be screened from the rest by the use of properly selected Screening Tests. This smaller group can further be classified as to *type* of defective vision and *extent* of defective vision by means of more extensive and precise Qualitative Tests to determine type and Quantitative Tests to determine roughly the extent of the defect.

Persons with defective color vision are not red blind, green blind, blue blind or yellow blind. Such a terminology belongs to an old and invalidated concept. Rather they are now classi-

fied as possessing defective red-green (or blue-yellow), discrimination. A low sensitivity to red is always accompanied by some defect in green discrimination although blue-yellow discrimination may be normal. If the person with defective red-green discrimination shows a preponderant insensitivity to red and blue-green and has a definite shift in his luminosity curve he is of the proto type; if the predominant insensitivity is to green and red-purple and his luminosity curve is normal he is classified as deutero type. The trito type is violet-yellowgreen insensitive and the tetarto type is still theoretical. If the insensitivity to the colors mentioned above is complete, or almost so, the person is classified as a dichromat (protanope, deuteranope, tritanope); if only partial he is classified as an anomalous trichromat (protanomalous, deuteranomalous, tritanomalous). Very low sensitivity to all colors is classified as LOW DISCRIMINATION which, in its extreme form, approaches MONOCHROMASY, ACHROMASY or TOTAL COLOR BLINDNESS.

In some fields of human activity those with defective color discrimination should not be employed. The presence of their defect constitutes a hazard to themselves and others. This has long been known. What has more recently been established is that, despite possessing a mild degree of certain types of defective color vision, many so-called color defectives perform well in certain fields of activity, and their defective color discrimination does not constitute a hazard nor should their participation in activities in these areas be proscribed. For example, a person with a mild degree of deuteranomaly may well work in the field of bookkeeping using red and black inks; he may also work well in the field of radio and television repair where electric wires and resistors are color coded; he may also perform excellently in the field of heterochromatic photometry; and he may be equal if not superior to others in such activities as camouflage detection. In some of these occupations the services of a person with a stronger defect or with protanomaly might well prove economically or mortally hazardous.

In general those with defective color vision should not be employed in activities wherein particularly red and green colors are to be discriminated from each other or from yellow. Defective blue-yellow discrimination, a rarer form of defect, should be viewed with suspicion. In many older people a defect in fine color discrimination, probably due to a yellowing of the lens of the senile eye, may be largely compensated by long experience; nevertheless in certain activities, such as matching materials for military uniforms—especially blue materials—this defect may prove (indeed has proved) economically costly.

Since the general public has never been and probably never will be adequately tested for the presence of those with defective color vision and since the 5 per cent fraction will probably continue as a rather steady proportion, it is the counsel of those working in the field of color vision testing to limit potential hazards as far as possible by two further means: (1) utilize as signal colors those which are best discriminated even by persons with defective color vision; and (2) wherever possible use contour or geometrical design signals instead of signals requiring good color vision for their

recognition. An example of the first means is the use of blue-green and red-yellow traffic lights instead of simple green and red; an example of the second means is utilizing the *positions* of the lights as a recognizable signal (red always on top); of using pattern instead of color in wire coding; of outlining dangerous moving machinery with a broad-line contour; or of using geometrical shapes rather than colored patches in a signaling code.

Two further generalizations of the utmost consequence must be mentioned before proceeding to list activities in which color discrimination is important and to suggest procedures.

Three Factors Vital in Testing

It is vital, it is essential, it is fundamental that color testing be viewed as a three-factor process. This cannot be overstressed, and yet failure to recognize this simple fact has wasted an enormous amount of time and effort spent in color vision testing. This point has repeatedly been emphasized by myself as well as others and yet it is so often ignored as to render much, if not most, of color vision testing invalid. Any test of color vision involves three equally important factors: (1) the illuminant to be used; (2) the subject to be tested; and (3) the test and its proper administration.

In such a situation any one of the factors may be tested if, and only if, the other two are standardized or constant. Yet it is the rule rather than the exception to leave two of the factors (1 and 2) variable and thus hopelessly muddle any results obtained. The light (factor 1) is an instrument to be used in order to enable the subject (factor 2) to perform a certain task (factor 3). It is obvious that if on one occasion the subject is given a wretched instrument and on another occasion he is given a perfect instrument, he will perform differently on the two tests. At county fairs a man tests his strength by striking a blow on one end of a lever, the other end of which drives a ball up a guide wire. Other things being equal, it is obviously no test of strength if he is given a tack hammer and the next man a sledge hammer. Considering the fact that color vision tests have been given to hundreds of thousands of subjects, a fantastic amount of time and effort has been wasted through ignorance or disregard of this simple fact. It is established that by far the greater amount of work on color vision testing has been futile and invalid.

Color vision tests are deliberately designed to be tricky and critical. The more critical they are the more accurate they are, but the more carefully must they be administered. This means that more care must be used in selecting the illuminant and in administering the test.

Most color vision tests as presently administered are not tests for defective color vision but tests for lighting systems. It is easier to test factor 1 (the illuminant) than to test factor 2 (the subject), and this is what is commonly done. Excellent tests, using metameric colors, are now available for testing illuminants, but ordinary tests intended to evaluate color vision are usually—although unwittingly and erroneously—so administered that they test primarily the illuminant.

Standard Lighting Needed

Even the pseudoscientists who always use "daylight" fall into this

error, for their 10 footcandle daylight, as has been shown, varies from candlelight to light much bluer than average north skylight. The stage has been passed where anything which comes in through a window can scientifically be called "daylight illumination." Properly administered, practically all color tests using reflected light are independent of the amount of illumination between 10 and 60 footcandles.

It must therefore insistently be demanded that color vision testing procedures be conducted under standard conditions of illumination and in America the preferred standard is illuminant C, International Commission on Illumination (ICI-C). Practically all color vision tests involving the use of reflected light were designed to be used under illumination approximating that given by ICI illuminant C, and to employ the test under other conditions not only invalidates it but yields misleading results. The use of Mazda light in administering such tests as the Ishihara, the Stilling, the American Optical Company, the Rabkin and the Hardy-Rand-Rittler plates not only fails to trap but actually assists the escape from detection, particularly of deuteranomalous and mildly protanomalous subjects. Similar results have been found by the Navy Department. It were better not to give the test than to give it under conditions which almost inevitably mislead.

It is highly probable that all good tests utilizing reflected light which are to be made available in this country in the future will specify ICI-C or a close equivalent as the illuminant to be used, and it is very likely that with most of them the illuminant will be sold as an integral part of the test.

A second, and closely related, complicating generality is expressed in the statement that up to very recently (World War II years) all the commonly used tests for defective color vision were unreliable and largely ineffective *as they were ordinarily administered*. Part of this inefficiency was probably due to the illumination factor just discussed but other factors added to the confusion. Most tests were imported or copied or run through several editions and it seemed obvious that in these procedures errors were never eliminated—rather they were multiplied. Each producer copied all the errors of his predecessor and added many of his own.

Under the inspiring and cooperative leadership of the Inter-Society Color Council (I.S.C.C.) a noncommercial organization representing all those learned, scientific, professional and industrial organizations, plus individuals interested in color and its problems, many groups and individuals were persuaded, about 1943, to undertake studies aimed at remedying the situation. Much excellent work resulted and the practical problems of color vision testing may now be said to be largely resolved. Several good foreign and some excellent American tests have been produced. Their lack of wide availability remains a handicap to be overcome by commercial or military sponsorship of large scale production.

Practical Utilization

Very few people, lay or professional, realize the tremendous importance color discrimination plays in our daily lives. If, as has been stated, 80 per cent of our voluntary motor activity is controlled by our eyes it is equally

likely that 80 per cent of our visual activity is influenced by color. The literature on color is so extensive as to, in itself, require statistical treatment. Hence only the barest, suggestive outlines can be given here but the following spring to mind faster than they can be noted.

Military

In the Air Force flares, signal lights and flags, running lights, biscuit guns, the cockpit and the navigation room all utilize color significantly. The Army has important uses of color in code transmission, signalling, recognition of enemy and friend, camouflage, Ordnance, Quartermaster and S.O.S. specifications; the Navy in running lights, coast lights, recognition and camouflage, danger and safety signs, equipment, matériel and uniform specifications, etc.

Industry

ICI Standards are widely used as well as Lovibond, Wratten and display lighting filters. The Maerz and Paul, Ostwald and Munsell dictionaries, atlases and standards are used in solving enormous economic problems. Cotton, citrus fruits, oil, paper, butter, margarine, vegetables and meat are all color-graded. In the production of displays, metal finishes, textiles, printing inks, papers and pulps, color discrimination, specifications and standards save millions of dollars annually. How many billions of dollars would have to lie idly invested in car finishes, furniture and appliance finishes, and trademarked goods unless duplication could be achieved by precise and satisfactorily reproducible standards? Safety engineering largely involves color in traffic control, coding machinery and structures, increasing visibility and removing danger. Efficiency in electrical engineering is increased by color-coded wires in all circuits from house lighting to advanced electronics. The multibillion-dollar advertising industry knows the attention-arresting value of color, its mood effects and esthetic appeal. What madame will wear next year (beige or cyclamen) is being decided for her right now by Gargantuan opinion polls and, once decided, she will be overwhelmingly bombarded by the hucksters' billion-dollar budgets.

Education

Vocational students are being trained for radio, TV, electronics and other services requiring color discrimination; the needle trades workers will labor in the fields of textiles and furs where accurate color matching is imperative; the chemistry students need good color vision for titrations, staining, colorimetric analyses; and visual education will be more and more involved with color diagrams, colored animations, colored maps, movies and TV. The psychologist is concerned with color in mood production, sales preferences, visibility of moving objects, of colored signals on various backgrounds (license plates, legibility on colored stationery, etc.).

Science

The construction engineer uses color coding for material identification, placements, hot and cold water systems, steam, brine, waste, gas, suction and air pipes; for power conduit coding as well as for coding other conduits for lighting, radio, telephone, alarm, intercommunicating, refrigeration, air-conditioning, heating and servomechanisms to various parts of a structure;

the mining engineer and geologist in prospecting and map making, in grading materials and coding their sources. Geographical, weather, agricultural, economic, political, industrial and ecological as well as thousands of other maps are color-coded. The chemical engineer uses color in stains, titrations, chromatography, a thousand industrial analytic color reactions, chromatic standards, spectroscopy and flame tests; the optical engineer in wave-length dimensioning, ray tracing, producing achromatic and aspheric systems, surface aberrations, fringes, Newton's rings, coated lens systems indices of refraction, mono-layer and thickness estimations, stress and strain measurements, photography and fluorescence; the illuminating engineer in classifying illuminants, color-temperature scales, metameric matches, qualitative illumination, increasing visibility, etc.

Medicine

Color is frequently used in medicine for diagnosis and description (qualitative perimetry, cyanosis, dermatological descriptions, pallor, flushing, icterus, anemia, plethora, hyper- or anoxemia, roentgenology, a hundred diagnostic chemical tests, colored Rorschachs, etc.) and very critically by the dentist in ceramic matchings.

The Arts

The arts are largely concerned with color discrimination in productions and reproductions; in printing inks, dyes, stains and paints; in theatrical design, illumination, make-up and filters; in glazes and surface colors; in fashion design and production; in architecture and philately; in jewelry and ceramics; in plastics and handicrafts; in interior decorations and in esthetics. The list alone is endless and exceeded only by man's incapacity to encompass it.

How, then, if there is such a great need in the world for color discrimination and if we have adequate tests for classifying this ability, can we solve the problems of safeguarding ourselves against danger and most efficiently utilizing the special abilities of those with exceptional talents?

Variety of Color Vision Tests

More than 200 devices or methods for testing or measuring color vision have been proposed, described, or used. Some of these are at present only of academic interest (after-image tests, flicker fusion tests, etc.); some are very complicated, requiring elaborate apparatus and expert knowledge (luminosity curves, hue and chroma discrimination curves, etc.); some are simple screening devices aimed to separate observers with defective color vision from those with normal color vision ("Screening Tests"—Ishihara, Rabkin, Stilling, A.O.C. polychromatic plates, etc.); some are designed to go further and to classify the type of defect ("Qualitative Color Vision Tests"—Nagel anomaloscope, Farnsworth profile, H-R-R plates, Nagel's cards, Trendelenburg's dots, Schaaff's mosaic, etc.); and some are intended not only to separate subjects with defective color vision from the normals and to diagnose the type of defect but to yield also an estimation of the extent of the defect ("Quantitative Color Vision Tests"—H-R-R plates, Trendelenburg's dots, etc.). There is another large category of color vision tests which are designed to test abilities

under special circumstances (color aptitude tests, luminous signal tests, and many vocational specialty tests).

Something greatly to be desired is a simple, easily administered, unlearnable test which will reliably "screen" (separate), subjects with defective color vision from those with normal color vision. If such a test could be made qualitative (diagnose type of defect) and also quantitative (yield an estimate of the extent of the defect: mild, medium, strong)—its value would be greatly enhanced. In order to maintain the advantages of simplicity and wide applicability such a test would have to be administered separately from more complicated and specialized laboratory tests designed for specific and special purposes. No single or simple test will yield all the data a competent examiner needs for a complete description of a subject's color discrimination abilities.

Comprehensive Evaluation Made

A program, the purpose of which was to evaluate critically and to improve the best of the old tests as well as to devise new and better tests, has been under way for the past eight years in the Knapp Memorial Laboratories for Physiological Optics at the Institute of Ophthalmology (New York City). This program was carried out in collaboration with the U.S. Army Air Force, the U.S. Navy, the Submarine Service, the National Bureau of Standards and the Inter-Society Color Council.

The chief results of these investigations to date have been:

1. A series of reports critically evaluating the most commonly used tests.
2. Reports on the important factors involved in color vision testing and recommendations for improving techniques.
3. The classification and rough evaluation of about 100 different color vision tests.
4. A simplified clinical classification of color vision and its defects.
5. The production of several new devices for evaluating the status of an observer's color vision. (These include the I.S.C.C. chip matching test, a recording matching test, a simplified anomaloscope, normal and defective color vision spectra, a neutral point matching device, etc.)
6. The production and validification of the H-R-R plates, a series of unlearnable, uncoachable polychromatic plates which not only screen observers with defective color vision from normal observers but yield red-green and blue-yellow defect classifications and a quantitative estimate of mild-medium-strong as well. A small edition of these plates has been produced under contract with the Office of Naval Research and has been subjected to validification studies in the Knapp Memorial Laboratories as well as in collaborating laboratories cooperating with the I.S.C.C.

We, and I here include my coworkers Gertrude Rand, Ph.D., and M. Catherine Rittler, A.B., to whom most of the investigative efforts of the past eight years must be credited, believe that with these plates we have made a commendable contribution to the solution of this problem—a contribution which, without discredit, might fittingly be dedicated to Dr. Lancaster in honoring him for his protracted and profitable labors in the field of physiological optics.

Practical Color Vision Tests

In the preceding discussion I have referred to such tests as the "Screening Tests," "Qualitative Tests," "Quantitative Tests," and "Special or Aptitude Tests." This division into functional categories is not a standard, or even well-known, classification of color vision tests. It is a simplification of a much larger descriptive list which we created to assist us in typing the many tests which we critically evaluated. Since it classifies color vision tests by function rather than by operation or description it has great value in aiding the prospective user to understand and specify just what he desires.

We, therefore, propose the classification of practical, working color vision tests (as opposed to laboratory or research tests) into four categories:

1. ***Simple Screening Tests,*** designed *to separate subjects* with defective color vision from those with normal color vision.
2. ***Qualitative Diagnostic Tests,*** designed *to classify the type* of defective color vision.
3. ***Quantitative Diagnostic Tests,*** designed *to indicate the extent* of the defect in color vision.
4. ***Aptitude, or Special Tests*** (luminous signal tests, lantern tests, fog lights, running lights—aviation, marine and railroad, aptitude tests for special vocations, etc.), designed *to determine a subject's relative fitness for a particular vocation.* These tests may usefully be applied to those with normal color discrimination as well as to those with defective color vision. It must be remembered that results of tests utilizing reflected light which ordinarily involve large retinal images of low brightness may only with reservations be applied to situations demanding recognition of luminous signals which yield small retinal images of high brightness.

Hardy-Rand-Rittler Test.—Utilizing this classification, the H-R-R Test constitutes a series of polychromatic plates encompassing the first three categories listed above. It is divided into four parts: (1) three demonstration plates; (2) five screening plates (Plates 1–5); (3) nine qualitative and quantitative plates for diagnosing red-green defects (Plates 6–14); and (4) four qualitative and quantitative plates for diagnosing blue-yellow defects (Plates 15–18).

The test is of the pseudoisochromatic type utilizing, however, only confusions of color with gray; i.e., patterns in critical hues are presented on backgrounds of neutral gray. The hues are selected so as to provide a qualitative analysis of the type of defect, and each hue is presented in a graded series in increasing chroma to indicate the extent of the defect (quantitative diagnosis). This arrangement also permits a qualitative diagnosis whether the defect be mild, medium, or strong. If, for example, a pair of critical colors (designed to trap protodeutero, or red-green defective observers; or trito-tetarto, the blue-yellow defective observers) is presented in medium intensity only, as is usual in pseudoisochromatic plates, those whose defect is mild may read both designs, while those whose defect is strong may read neither, and no qualitative diagnosis is indicated.

Plastic Paints Used.—The plates are printed with plastic paints con-

taining no linseed oil or printing inks. One of the most serious defects of printed tests for color vision has been the impermanence of the colors and their deterioration with age. This is an inescapable factor in all printing involving the use of linseed oil inks. Another serious defect is the variability of the color with succeeding copies in a production run. Both these defects, we are assured by our color consultant, Mr. Foss, have been satisfactorily overcome in this set of plates in which paints on a plastic base rather than inks are used.

Eight principal hues are used, varying in chroma and value (saturation and brightness), and four values of neutral gray. The colors are accurately controlled for chromatic qualities and permanence. The hues and values for the proto- and deutero-types were carefully adjusted empirically to the average neutral points (under Illuminant ICI-C) of a group of these two types of dichromat. The grays were likewise adjusted for these neutral points. The hues and values for the trito- and tetarto-types (the latter theoretical) were adjusted in accordance with Judd's description of the neutral points of these two types. All background patterns are identical and yield no clues for memorization or coaching. The symbols are simple geometrical designs which are familiar to foreigners, illiterates and children.

Illumination.—Any critical color test using reflected light is dependent upon the illumination utilized. It is mandatory that this test be used under 10–60 footcandles of Illuminant ICI-C or a close approximation to this illuminant. We recommend the Macbeth Easel Lamp designed for color vision testing.

In interpreting results Plates 1–5 are the screening series. Of these, Plates 1 and 2 test the blue-yellow vision, and Plates 3–5 the red-green vision. If no errors are made in this series, color vision is normal and no further testing need be made. If errors are made in the screening series (Plates 1–5) the remaining plates are used to determine the type and extent of the defect. If, as is usually the case, the errors are only in the red-green series (Plates 3–5), Plates 6–14 are administered; if errors are made only in the blue-yellow series (Plates 1 and 2), Plates 15–18 are given; if errors are made in Plates 1 or 2 and in Plates 3 or 4 or 5, all of Plates 6–18 must be given.

The qualitative and quantitative classification is indicated in the sheet used for recording. Interpretation of the type of defect is shown by a preponderance of correct responses in the proto, deutero, trito, or tetarto columns. Interpretation of extent (mild—medium—strong) of defect is based on the last group of plates in which errors occur. For example, if any errors occur in the group of Plates 10–12 or 15–16 but not in the group 13–14 or 17–18, the defect is anomalous trichromasy of medium extent. If any errors occur in the group of Plates 13–14 or 17–18, the defect is either dichromasy or extremely strong anomalous trichromasy (approaching dichromasy). Extensive scattered errors may indicate malingering, monochromasy, or low color discrimination approaching monochromasy.

Much broader claims are made for these plates than are usually attached to a test of this type; but since they have successfully passed through three critical validation surveys it is our belief that the claims have been substantiated.

Summary

The working basis of Color Vision Testing involves the formulation of a hypothetical Standard Observer, a physiological abstraction, in terms of which colors and illuminants can be specified with a high degree of accuracy. This Standard Observer is part of a color vision testing triad which permits two of the three factors always involved in such testing to be specified and held constant. By means of a Standard Observer, standard illuminants and standard testing materials are made possible.

Color discrimination is an important factor in our daily lives. A defect in this ability may be innocuous or may be extremely hazardous. The areas of harmlessness and those of hazard should be known—and persons with defective color vision should be kept from activities in which the defect may result in damage to property, health, or life.

Tests for discovering such persons with defective color vision have been produced and validated. They involve three basic types and should always, in the case of those with defective color vision, be supplemented by special tests of a fourth type which deal directly and specifically with the activity and hazard involved. Even in the case of subjects with normal color vision, aptitude tests are desirable for the determination of special abilities.

The Hardy-Rand-Rittler (H-R-R) Polychromatic Plates for testing color vision have, in three validation surveys, proved highly reliable in all of the first three categories of color vision tests. Rather unusual claims made for them have thus been substantiated.

To wrest from nature the secrets which have perplexed philosophers in all ages, to track to their sources the causes of diseases, to correlate the vast stores of knowledge, that they may be quickly available for the prevention and cure of disease—these are our ambitions.

SIR WILLIAM OSLER.

Telescopic Spectacles

James E. Lebensohn, M.D., Ph.D.

Department of Ophthalmology, Northwestern University Medical School

Chicago, Illinois

GIVES history, description, and practical application of use of telescopic lenses, pointing out that for amblyopic individuals who can afford them, modern prescription telescopic spectacles offer the best optical aid.

IN the world today Braille is used in 85 languages to serve seven million human beings. The uncorrectable vision of these persons is 4/200 or less. If the attainable acuity is 10/200 or better and the visual field is fairly intact, the individual can generally move about safely indoors and out without assistance. But even with a corrected acuity of 20/80, reading is impossible unless the image is magnified to the equivalent of 20/40. A hand magnifier may be adequate for this purpose but where the hands must be otherwise employed as in writing and working a spectacle magnifier is essential.

In its most simple form a spectacle magnifier consists of ordinary spectacles fitted to give the better seeing eye a closer reading level. In near additions of over 4 diopters the magnification is one-fourth of the total dioptric power added. Thus if the addition is 8 diopters the print is magnified twofold, but near vision is fixed to the principal focal plane of 8 diopters or 5 inches. With 6 diopters added, the magnification is 1.5 x but the focal range is extended to nearly 7 inches—a more satisfactory distance. Telescopic spectacles provide magnification up to 2.2 x while still maintaining the near distance at 10 inches. The telescopic unit can be combined with the spectacle magnifier to produce a "telescopic magnifier," whose magnification is the product of the respective enlarging elements. For example, the addition of 8 diopters to the 2.2 x telescopic unit increases the magnification to 4.4 x though at the sacrifice of reading distance which is again cut down to the principal focal plane of the power added.

The obvious advantages of telescopic spectacles have stimulated remarkable advances in optical design and spurred many leading ophthalmologists—including Hertel, Lancaster, Gradle, Berliner, Mayer and Pascal—to encourage their use. The draw-

backs in the use of telescopic lenses are such, however, that the leading American manufacturer, though improving and advertising his product for over twenty years, estimates that at present only 2,100 people in this country wear prescription telescopic spectacles for home or business use. Partly because of economic considerations makeshift substitutes are more commonly recommended.

Historical Background

The invention of the telescope in Holland in 1608 probably originated from some accidental manipulation of lenses, and was claimed simultaneously by three men—Lippershey, Jansen and Metius. Galileo, on hearing of this contrivance, worked out independently its optical principles, and in 1609 produced telescopes magnifying up to 33 diameters. Utilizing the greatest magnification he discovered in 1610 the satellites of Jupiter, the spots on the sun, the phases of Venus and the topography of the moon. Milton recalled these achievements in rhapsodizing about the moon "whose orb through optic glass the Tuscan artist views." As early as 1631 the myopic Gustavus Adolphus took occasional advantage of a hand telescope to improve his distant vision; and crude telescopes for near vision were designed in 1667.

In 1909, at the insistence of the ophthalmologist, Hertel, the Zeiss works first produced the modern optically corrected telescopic spectacle. By 1918, 148 patients in Germany were using them. In America, Gradle reported his experience in fitting 16 cases in 1924; and L. L. Mayer reviewed his total of 100 patients in 1929.

The Opera Glass

The familiar opera glass provides an excellent means of understanding the mechanism of telescopic spectacles. Both have the same two-lens combination—a positive object-glass and a stronger negative eye-lens, separated by the algebraic sum of their focal lengths. This Galilean system makes the most compact telescope, and has the further advantage of producing an erect image with a relatively large field.

An opera glass, in contrast to a telescopic spectacle, can be adjusted for viewing at different distances by controlling the separation of the lenses. For a far object the lenses must be set closer together than for a nearer object. Likewise an adjustment for the viewer's myopia or hyperopia can be effected by a contraction of the interlental space in the former instance, and an elongation thereof for the latter.

In both opera glass and telescopic spectacle enlarging the object-glass increases proportionately the field of vision; therefore the object-glass should be large while the eye-lens may be conveniently small. To secure the fullest available field the eye-lens is held quite close to the eye. By making the object-glass of much lower dispersion than the eye-lens, chromatic aberration is almost eliminated and the other major aberrations are simultaneously reduced. In the best instruments the object-glass is of fluor-crown glass, the eye-lens of high density flint glass; and all surfaces are coated with magnesium fluoride to reduce reflections.

The entrance and exit rays are both parallel in a telescopic system when adjusted for an emmetropic (normal vision), unaccommodated eye; the system has zero power. Magnification

ensues from the modification of the apparent angle subtended by the object, and the degree is most simply determined by dividing the focal length of the object-glass by that of the eye-lens.

Telescopic Spectacles

Telescopic spectacles differ from opera glasses in their extreme compactness and in a fixed separation of the lenses. For compactness strong lenses are required which in turn demand a correction of optical aberrations, particularly of the astigmatism of oblique rays, impossible to attain with separable lenses. Aberrations of negligible importance in a single spectacle lens become significantly disturbing in a telescopic system.

Distance Vision and Telescopic Spectacles

Magnification of distant objects can be obtained only by a telescopic unit. Unfortunately telescopic spectacles make the field too restricted and the judgment of distance too difficult to be worn constantly for distant vision. The magnification causes objects to appear abnormally large and close, and so accelerates movement across the field that it is hardly possible to keep up with objects in motion. Rather than deal with such unfamiliar conditions at the price of enhanced acuity, patients with defective vision prefer their original status.

For distant vision the function of telescopic spectacles is simply that of a convenient and precisely fitted opera glass. With its aid the individual, maintaining a stationary position, can view more advantageously the theater, movies and athletic events.

Near Vision and Telescopic Spectacles

Binocular telescopic spectacles are frequently used by the ophthalmic surgeon, dentist, engraver, diamond cutter, retoucher and other normal-sighted people engaged in delicate work for protracted periods. Precision types for this purpose are made by Zeiss and Cameron and generally work well if the telescopic units are centered to the eyes and converged to the proper angle. Eggers designed a simple twin-spectacle arrangement with 10 cm. separation which can be collapsed and fitted into a spectacle case. The magnification is twofold and the relatively weak lenses used do not require correction for aberration. A French firm has recently marketed a similar model in more compact form that lists now at $17.50.

All near-vision telescopic spectacles must be focused to the required distance by added power. This near addition is mandatory even in young people, since a telescope multiplies by its magnification the ocular accommodation that would otherwise be required. For this reason ocular discomfort may follow their prolonged use since the maintenance of convergence may be difficult without the habitual stimulus of accommodation.

But for sundry reasons patients with amblyopic vision are seldom able to use telescopic spectacles binocularly at the near distance. Only the eye with the better acuity is usually fitted with the telescopic spectacle, the other eye being dismissed with a dummy unit covered with a ground-glass cap. With the use of but one eye diplopia is avoided and slight maladjustments are not apparent. Since the width of the field is inversely proportional to the enlargement, the weakest magnifi-

cation that is adequate should be prescribed. Indeed the tubular vision of the telescope is even more noticeable at the reading level than at distance. The reading point is quite fixed—a displacement of even a few millimeters throws the print out of clear focus. Hence the patient must be trained to keep his eyes and head still while moving the print across the visual field at a constant reading distance. To aid steadiness the reading matter should be moved with the elbows held close to the body.

If a distance vision of 20/100 or better is attainable, a telescopic visual aid can be expected to provide successful reading vision. Calculation of the magnification needed requires that the acuity be graded according to the decimal system. For reading newsprint the equivalent of 0.5 (20/40) acuity is necessary. With a distance acuity of 0.2 (20/100) a telescopic unit of 1.7 x, combined with a reading addition of 6 diopters, will give an equivalent reading acuity of 0.2 x 1.7 x 1.5 or 0.51. This combination of a telescopic system with a magnifying lens, the "telescopic magnifier," is almost always necessary. As the magnifying lens increases in power the visual distance becomes more reduced and the field further restricted. An addition of 8 diopters may be considered the upper limit of tolerance.

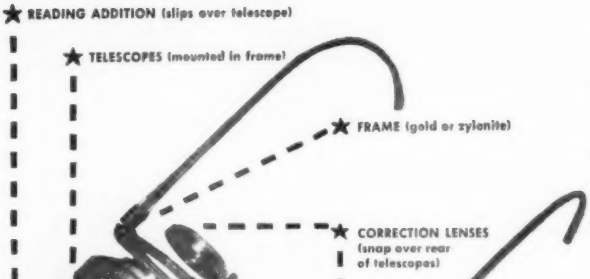
In certain cases the telescopic unit provides greater improvement than would be mathematically predicted as the enlarged retinal image affects visual cells that would not be stimulated otherwise. In a visual disturbance primarily due to a restricted lesion of the macula as shown by a small, eccentric or relative scotoma, the image is enabled to extend beyond the atrophic area and reach healthy retina. Among diseases that may have this characteristic are myopia, central chorioretinitis, toxic amblyopia, retrobulbar neuritis, albinism, and amblyopia ex anopsia. If opacities in the transparent media are incomplete, as in nebulae of the cornea and incipient cataract, an adequate visual enhancement is even more probable. In such cases, to avoid veiling glare from the ocular opacities, a useful help is a reading shield of black non-reflecting cardboard, 4″ x 5″, containing a central horizontal slit of one-half inch width.

Telescopic spectacles are contraindicated when: (1) the ocular pathology is not fairly stationary; (2) the visual field reveals major defects, as in retinitis pigmentosa, glaucoma and optic atrophy; and (3) the amblyopia is associated with nystagmus. The patient must be cooperative and eager to see—hence telescopic spectacles are unsuitable for the mentally senile and others unable to concentrate.

Types of Prescription Telescopic Spectacles

The Zeiss telescopic spectacles, developed by von Rohr, and the first of modern types, were introduced to America shortly after World War I. The units are made in 1.3 x and 1.8 x magnification, requiring an elaborate trial case and special frame for fitting.

Since 1933 the Kollmorgen Optical Corporation of Brooklyn has worked to minimize the various objectionable features that impeded the popular acceptance of telescopic spectacles. Recognizing that telescopic spectacles are impractical for constant distance use, two magnifications were offered for near, in 1.7 x and 2.2 x units. A more conventional appearance was



These elements, shown disassembled, comprise Spectels. The telescopic lenses are secured in the frame in the usual way. They are focused at infinity, a reading addition being slipped over one lens for close work. Correction lenses are removable for cleaning.

achieved in 1.7 x magnification. The accessory elements required for the telescopic spectacles—distance correction and reading addition—were designed to snap on to the rear and front of the telescopic unit respectively. This innovation permits a most desirable flexibility. The distance correction can be changed as indicated, and additions of various magnifications may be utilized according to the range and magnification required. For example, an amblyopic person may find the 6 diopter addition necessary for reading, but for writing and other work he finds the 4 diopter addition more serviceable. The use of interchangeable elements reduces the complexity of the telescopic-spectacle trial case and simplifies the testing procedure.

A radical change in optical design of the telescopic lenses served to increase the field of vision and improve depth perception. Instead of the spherical lenses of Zeiss the Kollmorgen design, developed by W. Feinbloom, substitutes cross cylinders, thus producing in the 1.7 x unit a magnification of 1.3 x vertically and 1.7 x horizontally. Experience has shown that when the magnification differs in the two principal meridians the image is psychologically referred to the place of least magnification and that the resulting distortion is not disturbing if the ratio of magnifications is less than 50 per cent. The field of the 1.7 x unit is 35° and of the 2.2 x unit, 22°, whereas that of the 1.8 x unit of Zeiss is 24°.

An even more radical departure in optical design is exemplified by the Univis telescopic spectacles evolved by E. Polackoff and introduced in 1936. The telescopic unit consists of positive and negative lenses of flint glass of refraction index 1.74, separated by standard crown glass—the whole fused into a solid sloping cylinder which for near use is inserted into the patient's distance correction at the position that a bifocal segment would occupy. Two magnifications are provided—1.5 x with a field of 24°, and 1.75 x with a field of 18°. The diameter at the object-glass end is 20 mm.; at the eye-lens end, 16 mm. This type has

Comparison of magnification and field of view between a 1.7x Spectel with plus 4 reading addition (left), 2.2x Spectel with plus 4 reading addition (right), and unaided eye (background). One-half actual size.

a rather bizarre appearance but has the advantage of light weight and permits the wearer to look past the insert and have his usual distance field.

Other Telescopic Aids

For those whose amblyopia is too extreme to be helped by telescopic spectacles Zeiss and Kollmorgen have designed microscopic spectacles which provide a magnification of 8 x to 1.8 x, with a reading distance of one to two inches. Like the familiar prism binocular its construction is essentially that of an astronomical telescope, fitted with prisms to diminish the length of the instrument and to erect the final image.

A monocular telescopic appliance of twofold magnification that is simple, relatively inexpensive, and can be clipped over the spectacle lens of the better eye is now commercially available in either a metal or plastic mounting. If the device is clipped over the patient's reading glasses the magnification is further increased through the added power. A third form of this telescopic accessory, produced by May Manufacturing Co., has collapsible metal arms and so can fit in a small flat case. This type comes in two magnifications, 1.9 x and 3 x, with reading depths of 9 and 5 inches respectively. Such appliances are quickly attached and removed, and are useful in the examiner's office for rapidly screening

cases that might be helped by telescopic spectacles.

The ingenious idea of creating a telescopic system by combining a contact glass having a flat central surface with a sufficiently strong spectacle lens was actually tried by Dr. J. W. Bettman in 1939, who thus secured a magnification of 1.6 x for distance; and with 6 more diopters added to the reading spectacle, a magnification of 2.4 x for near. Though the results were encouraging at first, the patient ultimately felt that the multiple problems of contact-glass wearing and telescopic vision were too much for him. In such arrangement the smallest eye movement produces extreme aberrations. Dr. Bettman has not repeated this arduous clinical experiment in the thirteen years that have elapsed.

The application of this idea to secure binocular vision after operation for one-eyed cataract offers less difficulty. Without some special adjustment both eyes cannot work together because the operated eye with its spectacle correction perceives an image 25 per cent larger than that normally experienced. Boeder proposed enlarging the image of the unoperated eye the necessary amount by rendering it hyperopic 3 diopters and correcting this difference by spectacles. It would seem better, especially in myopes, to minimize the image of the aphakic eye by adding excess plus power to its contact-glass correction and sufficient minus power to the spectacle lens for a reverse telescopic effect of the proper minification. A cataract minifying unit based on the principle of the reverse telescope was first produced by the House of Vision, Chicago, and later improved by the Bausch & Lomb Optical Co. These units would be more popular were it not that they are unattractive cosmetically, for the results are generally quite satisfactory.

Economic Considerations

The present apathy of the profession and public towards prescription telescopic spectacles is chiefly due to their cost, objectionable appearance, and their limitations. Because of the expense involved the patient and his friends expect a better performance from telescopic spectacles than can be secured. At current prices the items required for a typical case in which the better eye is fitted with a telescopic correction for occasional distant use, and extra additions for reading and writing, would total without taxes as follows:

Telescopic lens, 1.7 x for right eye	$40.00
Near additions, coated, 4 D. and 6 D.	22.50
Correction lens, coated, with mount	16.50
Balance dummy for left eye	17.50
Frame	9.00
Leather case	2.25
	$107.75

The examiner expects and usually finds that the average patient is prone to accept a less costly solution. A compact opera glass for use at the theater or movies can be had for about $12, and a clip-on telescopic accessory for reading lists at $15.50. But for amblyopic individuals able and willing to pay for the best possible optical help there is no adequate substitute for the modern prescription telescopic spectacles.

Progress in Orthoptics

Julia E. Lancaster, M.A.

San Francisco Ophthalmic Laboratory, San Francisco, California

DISCUSSES history of and developments in the field of orthoptics.

ORTHOPTICS is an aspect of ophthalmology which has had a dramatic history. It has had cycles of enthusiastic support and of contemptuous neglect. The nonsurgical treatment of strabismus has aroused interest since ancient times. A sound approach required the gradual development of an understanding of the neuromuscular problems involved and research on both the motor and sensory aspects of fusion. As information about the complete fusion act became available techniques for teaching the necessary fusion skills to the patient have also developed. Orthoptics has now reached a place where it is a reliable and sound therapy for certain binocular problems.

Orthoptic interest reached an early peak in England. With the publication of Worth's "Squint" in 1903 and with the invention of the major amblyoscope for treatment there was a rapid advance in fundamental knowledge and in techniques. Unfortunately the amblyoscope itself made a conspicuous impression on American instrument makers who quickly invented elaborate machines of no sound scientific value and marketed them with extravagant claims. The use of the word "orthoptics" by charlatans threw the whole field into disrepute.

Orthoptic Council Formed

Visitors to the English clinics, impressed by the valuable results of the type of treatments sponsored by the English Orthoptic Council, resolved to attempt a better control in this country. In 1938 the American Orthoptic Council was formed with Dr. Le Grand Hardy as president. The function of the Council is to stimulate interest and research in orthoptics, to examine candidates for the certificate of Certified Orthoptic Technician, and to maintain high standards in treatment, publications, and equipment. The Council consists of twelve ophthalmologists, three each from the American Ophthalmological Society, The American Academy of Ophthalmology and Otolaryngology, the Section on Ophthalmology of the American Medical Association, and the College of Physicians and Surgeons. There are also four associate members who are certified technicians—three chosen by the Council, and the President of American Association of Orthoptic Technicians. All members serve three-year terms in rotation. Dr. Lancaster has been an enthusiastic member of the Council. In the thirteen years since its inception the Council has sponsored important advances in orthoptics.

There are at present about 175 Certified Technicians in active practice. Examinations for the Certificate are held each year for about 30 applicants. Applications for training and examination are handled by the Chairman of the Committee on Instruction of the American Orthoptic Council, Dr. Richard Scobee of St. Louis.

Fusion

Motor and sensory fusion are inseparable in the individual. Motor fusion enables him to receive fusible images on the two foveas; sensory fusion is the process by which the brain interprets these images into a single image. Fusion is both a complicated neuromuscular act and an intellectual and emotional experience. It requires practice to be perfected in either aspect. The mechanism for acquiring it is innate but use is necessary for development. If the use is normal the development will be normal. In the presence of obstacles there will be adjustments to the problem of fusion. When the obstacles are removed (by growth or by treatment such as refraction or surgery) the adjustments may persist as conditioned reflexes.

Portions of the innate fusion mechanism are such that a comfortable adaptation to the problem of a clear single image can be made without fusion. There are five steps to the achievement of motor fusion, and four possible adaptations to the problem of sensory fusion. The motor fusion skills acquired in sequence given are: fixation, versions, vergences, accommodation, and accommodation-convergence balance. It takes about six years before the visual apparatus is mature and the child is capable of full motor fusion skill. While the growing child is learning these motor skills he is bombarded by stimuli to which he must make sensory adjustment. If motor progress stops at any stage due, for example, to a paresis or hypermetropia, his sensory progress will not be normal in character but will make one or more of the three abnormal adaptations: suppression, anomalous correspondence, or tolerance of diplopia.

Orthoptic Treatment of Motor Factors

It is the function of orthoptics to help the patient develop normal motor fusion skills and accept normal sensory fusion so as to arrive at normal fusion habits for casual seeing. It is not enough to learn skills as such; they must be applied as part of normal fusion habits if they are to be of value for the patient. For this purpose orthoptics works in six areas: fixation, vergences, and accommodation-convergence balance in the motor area and correcting the faulty adaptations of suppression, anomalous correspondence or helping the patient tolerate diplopia in the sensory areas. Treatment is not confined to one area at a time. The motor and sensory components are not separable in the individual and cannot be separated for treatment. The emphasis can be shifted to meet the needs of the patient but the choice in treatment lies between efficient simultaneous development of motor and sensory factors, and treating one to the neglect of the other. The orthoptic treatment of motor factors is largely objective. It begins with the development of fixation on the fovea of one eye, then both eyes; next, the maintenance of fixation when the eyes are turned (version); then the development of fusion at various distances (vergence); finally the attainment of

accurately balanced accommodation and convergence.

Orthoptic Treatment of Sensory Factors

Sensory fusion, on the other hand, is entirely subjective. No one knows how another person sees, and we can only judge by his responses. Responses which can be observed are overt responses. Estimation of the character of the fusion status of a patient and of the changes which take place during orthoptic training depend entirely upon overt response. There are three kinds of overt responses: what the patient says; what he does; and how he feels (as shown by his facial expression or other emotional behavior). In the absence of overt response we can only assume that certain sensory perceptions are being accepted by the patient and we have no right to assume that what is desired is always happening, or even happening with sufficient consistency for efficient results. An important forward step in orthoptics is the shift in emphasis from prolonged objective motor stimulation by machines (practice in *what* is presented for seeing) to co-ordinated practice of perceiving sensory changes (*how* the patient sees) under controlled motor situations such that normal perceptions are as easy as possible.

Patient's Responses as a Guide

Worth's classic first grade of fusion is Simultaneous Perception. This requires that the first motor skill—fixation—shall take place without a faulty sensory adaptation (suppression or anomalous correspondence). If the images are fusible (alike) then fusion takes place. The second grade of fusion is Fusion with Amplitude, which requires the added motor skill of vergence control, plus the normal sensory perception of diplopia (double vision) when vergence fails. Many patients with normal sensory perceptions, when the images remain on the foveas, resort to the adaptation of suppression when vergence is attempted. Accurate classification of patients into Worth's two grades requires accurate objective separation of patients who fail to fuse because they have no *opportunity* to do so (do not have sufficiently stable images on the two foveas) from those who *cannot* fuse. Improved orthoptic techniques show so few patients who belong in the latter group that it is ceasing to be a useful orthoptic classification. On the other hand, improved techniques show a vastly enlarged group of patients whose sensory perceptions are adapted to suppression in all difficult binocular situations. Such patients fail to get fusion with amplitude. Many of them do get Worth's third grade of fusion: stereopsis. Stereopsis requires sufficiently stable binocular fixation (motor control) plus sufficiently stable sensory perception to permit evaluation of the stereogram or other stereoscopic situation. Suppression is often intermittent in character. If stereopsis is found to be present normal sensory perceptions can be achieved.

If the patient has achieved the first step in motor fusion (fixation) and in sensory fusion (simultaneous perception) it is important to find out whether he has normal or anomalous correspondence. Normal correspondence is the association of the images from the two foveas as belonging in the same visual direction. Anomalous correspondence is the association of the fovea of the fixing eye with a nonfoveal area of the other eye. Such

patients see no need to make a vergence movement to correct their strabismus; on the contrary such movement tends to give them the disagreeable sensation of diplopia. Hence they cannot make normal progress up the ladder of fusion success until their perceptions (sensory fusion) are trained to agree with their motor adjustment to foveal images. Orthoptics has an important function in developing such normal perceptions.

With stable fixation and normal sensory perceptions the patient is ready for the next step, which is vergence control—a motor skill. The key to vergence control is recognition of diplopia when control is imperfect; this is a sensory aspect. Hence practice in motor skills is much more efficient if sensory perceptions are developed at the same time. The recognition of diplopia is purely subjective and must be expressed in some sort of overt response before its correctness can be interpreted. Many patients do not know how to interpret binocular experience and make many erroneous judgments about what they see. Care is necessary to distinguish between the factual state of fusion and the patient's ideas about it. A convenient way to check this is by changing the fusion status (as by prisms or the amblyoscope) and finding out whether the patient makes correct observations about such changes. If he does not notice when errors occur he cannot be expected to make motor adjustments to them. This is why mechanized or unsupervised orthoptic training is inefficient. It may not be entirely wasted because some stimulus-response takes place at the reflex level, but it is less efficient than the full cortical recognition and voluntary correction of the fusion status.

Overt response by which sensory fusion can be evaluated is greatly helped by clear, concise, verbal reports about what is seen by the patient. Special care is necessary to prevent the use of the word "one" for both the single image seen by suppression and the single image perceived by fusion. The patient must observe carefully and report accurately if he is to recognize fusion errors and make an effort to overcome them. In the absence of effort, correction falls to the reflex level and there is no evidence as to whether it takes place. It is not valid to *assume* that the patient makes a correct sensory response, even when a correct motor response can be detected objectively.

Such overt response requires maturity in patients of any age. Correction of immature patients will be slow and inefficient. Hence maturity (not necessarily calendar age) is one of the most important criteria in the selection of cases for orthoptic treatment.

Need for Research

The continued progress of orthoptics requires research into methods of making overt response reliable, especially in the younger children, and in methods for prompt evaluation of the ability of the patient to co-operate effectively beyond the point of supervised training to the development of fusion habits. Fusion is a learned skill and is subject to all the obstacles to learning: innate disability, indifference, and impatience. It is not difficult to select cases who *could* profit by orthoptics, but it is still difficult to make prompt, efficient selection of cases who will make the effort necessary to climb the ladder of binocular success.

Trends in Causes of Blindness in New York State

C. Edith Kerby, *Associate for Statistics and Analysis*

National Society for the Prevention of Blindness

DATA on cases of blindness reported in recent years under the mandatory reporting law in New York indicated for the first time a potential source of information on the current rate of occurrence of blindness in each age group and from each cause. The Commission for the Blind, New York State Department of Social Welfare collaborated with the National Society for the Prevention of Blindness on further statistical analysis of data, the Commission providing case material and the Society making the tabulations and analysis.

SINCE 1946, New York State has had mandatory reporting of each case of blindness coming to the attention of physicians, nurses, health and social agencies. An ophthalmological examination record is also requested for each. Procedures are now well established and the cooperation of professional groups is good. Some cases not of recent occurrence are still coming in. This is unavoidable, since individuals whose vision deteriorates slowly do not necessarily come to the attention of persons responsible for reporting cases at precisely the time when blindness, as defined by law, is reached. With these reservations, it can be assumed that reporting is practically on a current basis.

By the time the present analysis was made, 9,790 cases reported during the five-year period from 1946 to 1950 had been coded and summarized by the New York Commission for the Blind,* which also cooperated in the provision of additional detail for this report.[1] For comparison, data are available from previous studies of causes among children in schools for the blind and among adult recipients of aid to the blind in several states, as well as reliable estimates of the number of the blind by state and by age in the United States as of 1940.[2, 3, 4]

Trends in Blindness Rates

As of 1940, Hurlin[4] estimated the prevalence rate of blindness in New York State to be 1.44 per 1,000 of the general population, as compared with 1.75 for the United States. On December 31, 1950, the New York Commission for the Blind had on its register

* Through the services of Miss Isabel Norkewicz, Welfare Eye Classification Analyst.

TABLE I. BLINDNESS PREVALENCE RATES, NEW YORK, 1950

New York State Register as of December 31, 1950	*Number*	*Rate per 1,000 Population*
Blind—verified by report of eye examination	20,207	1.36
Additional cases reported—eye report not yet received	1,458	.10
unclassifiable	73	.01
Total	21,738	1.47

20,207 verified cases, plus 1,531 which had been reported but not yet been officially classified.

If we count only classified cases, the blindness rate for New York in 1950 was 1.36 and a probable reduction in blindness in the last decade is indicated. If, on the other hand, we were to assume that all cases not yet classified will prove to be blind, the rate would be 1.47, which suggests that the rate has remained about the same, or possibly increased slightly.

TABLE II. CASES OF BLINDNESS REPORTED IN NEW YORK STATE 1946 TO 1950

Year	*Number*	*Rate per 100,000 Population*
1946	2,353	16.5
1947	1,690	11.7
1948	1,805	12.4
1949	1,925	13.1
1950	2,017	13.6

Evidence that blindness is increasing in New York is seen in the data on cases reported in successive years. We must discount the figure for cases reported in 1946, which probably includes an accumulation of cases from previous years. We have already mentioned the fact that the total for any year includes some cases occurring at an earlier date. It is also possible that some of the increase from year to year represents an improvement in administration of the reporting law. Nevertheless, the upward trend in incidence rates is so consistent that it probably indicates a real increase. The fact that blindness is in fact increasing in certain age groups and from specific causes can be demonstrated by examining details of the New York data.

Distribution of Blind by Age

The New York Commission for the Blind routinely classifies its cases into age groups corresponding to its basic service functions. This grouping, shown in the table below, has been used throughout our analysis.

The proportion of the total blind in the United States estimated to be under 20 years of age in 1940 was 4.7 per cent. On the New York State register as of 1950 the number under 18 years was 6.4 per cent. It is possible that the percentage for 1940 may have been underestimated. Also educational, health and social agencies are definitely doing a better job of case finding and reporting. Nevertheless, these factors do not account for the entire increase in blindness among children found in the New York data.

TABLE III. DISTRIBUTION OF BLIND IN NEW YORK STATE BY AGE GROUP

Age Group	*Cases Reported in 1950*		*Register of Blind as of December 31, 1950*	
	Number	*Per Cent of Total*	*Number*	*Per Cent of Total*
Under 7 years	138	6.8	500	2.5
7 to 17 years	88	4.4	788	3.9
18 to 49 years	360	17.9	..	..
50 to 64 years	529	26.2	18,919	93.6
65 years and over	842	41.7	..	..
Age not reported	60	3.0	..	..
All ages	2,017	100.0	20,207	100.0

Among new cases reported, children under 18 constituted 7.8 per cent in 1947; 8.2 per cent in 1948; 9.7 per cent in 1949; and had risen to 11.2 per cent by 1950.

Percentage distribution can be misleading. However, the figures in Table IV which show incidence rates verify the upward trend of cases in the child age groups, and show rates to be increasing at all age levels except young adults (18 to 49 years).

To find the reasons for these alarming tendencies we must examine the data on causes of blindness.

Using available data, mentioned above, it is possible to estimate the distribution by cause of the total blind in the United States as of 1940. Table V shows these figures as compared with the distribution of new cases reported in New York State in 1950.

One of the first facts to be noted is that the picture is not all bad. Substantial decreases are indicated in blindness due to *Infectious Diseases* and *Injuries*. However, blindness due to the *General Diseases* (chiefly diabetes and vascular diseases) now takes first place among cases of known cause. Also, eye conditions of *Prenatal Origin* and those whose cause is *Unknown to Science* show substantial increases.

TABLE IV. ANNUAL INCIDENCE OF BLINDNESS IN NEW YORK 1946–1950

Age Group	*Rate per 100,000 Population*				
	1946	*1947*	*1948*	*1949*	*1950*
Under 7 years	6.2	5.3	5.2	7.0	7.5
7 to 17 years	4.6	2.1	2.7	2.8	4.0
18 to 49 years	7.0	4.9	5.8	5.5	5.2
50 to 64 years	23.1	17.3	19.1	18.1	20.2
65 years and over	91.1	59.4	58.7	64.3	65.5
Total all ages	16.5	11.7	12.4	13.1	13.6

TABLE V. DISTRIBUTION OF THE BLIND BY CAUSE
1940 Estimates for U. S. Compared with
New York State New Cases for 1950

Cause Group	*All Blind U. S. 1940 (estimated)*	*Cases Reported in N. Y. State 1950 (actual)*
Infectious diseases	22.9	5.9
Injuries	9.3	2.4
Poisonings	0.6	0.2
Tumors	0.9	1.1
General diseases*	5.5	20.0
Prenatal origin*	11.8	15.5
Unknown to science	29.9	45.7
Undetermined or not specified	19.1	9.2
All causes	100.0%	100.0%

* Not elsewhere classified.

The change in the *General Diseases* may be less marked than the figures imply, since it is quite possible that in 1940 a large portion of such cases were concealed in the *Undetermined* group, whereas for cases occurring in 1950, diagnosis is probably more exact. Moreover, percentages indicate only the changes in relative importance of the various causes, not the amount of increase or decrease in each.

Changes at Various Age Levels

Sample groups showing only percentage distribution are available for 1940 for New York State. Comparison of these with data for 1950 shows that the decreases in cases due to *Infectious Diseases* and *Injuries* occurred at all age levels (see Table VI). The increase in cases due to *General Diseases* is also seen in all age groups but the importance of this cause is very much greater at the adult than at the child age levels. An increase in the proportion of cases of *Prenatal Origin* is noted, as would be expected, only in the child age groups. Cases under *Unknown to Science* show an increase at school age as well as at adult age.

Child Age Group

In the data for the preschool age the increase due to the single cause, retrolental fibroplasia,* was sufficient to offset not only the decreases noted above but also a rather marked reduction in all other cases of *Prenatal Origin*. Some of that change may be apparent rather than real, because cases of this type would necessarily have shown a different diagnosis in 1940 before the term was coined by T. L. Terry, M.D. Since we do not yet have an effective method of prevention or treatment, the fact that retrolental fibroplasia cases constituted 53 per cent of the new cases of preschool age in New York State in 1950 is alarming.

Our biennial studies of the blind of school age cover about three-fourths of the total in the United States. In recent years these reports have shown

* Cases of retrolental fibroplasia are classified here in the prenatal group.

TABLE VI. DISTRIBUTION OF THE BLIND IN NEW YORK STATE BY CAUSE
Sample Groups as of 1940 Compared
with New Cases Reported in 1950

Cause Group	*Per Cent of Total*					
	Preschool		*School*		*Adult*	
	1940	*1950*	*1940*	*1950*	*1939*	*1950*
Infectious diseases	12.6	2.2	20.7	9.1	29.3	6.1
Injuries	3.1	..	8.1	3.4	8.6	2.5
Poisonings	..	..	..	..	0.3	0.2
Tumors	6.3	0.7	4.3	3.4	0.4	1.1
General diseases*	..	2.9	1.9	3.4	4.1	22.2
Prenatal origin*	74.2	92.0	53.3	68.2	9.9	6.9
Unknown to science	1.9	1.5	1.9	7.9	25.6	51.1
Undetermined or not specified	1.9	0.7	9.8	4.6	21.8	9.9
All causes	100.0	100.0	100.0	100.0	100.0	100.0

* Not elsewhere classified.

an upward trend in the cases of *Prenatal Origin* more than sufficient to offset reductions in cases due to other causes. This same trend is seen in the figures for the blind of school age in New York.

Adult Age Group

Inferences drawn from comparison of data on adults as of 1939 and 1950 must be qualified somewhat. The two sets of figures are not strictly comparable, because cases included in the 1939 study[5] were originally classified under another plan. In spite of this, when the figures of that study were regrouped, item by item, in accordance with the standard classification, the distribution by cause proved to be quite similar to that found in studies of adult groups in 26 other states. The only notable exception was an unexpectedly low percentage of senile cataract cases—6 per cent of the total, which is somewhat less than half the 1940 average for 26 states (17 per cent); and very much lower than the 21 per cent found among new cases reported in New York in 1950.

Granted that the amount of the changes in causes from 1939 to 1950 cannot be measured exactly by the figures for adults shown in Table VI, the differences are too great to leave any doubt of the direction of the changes—downward for most causes but upward for *General Diseases* and for causes in the *Unknown to Science* group, which includes affections such as primary glaucoma, senile cataract, myopia.

Since glaucoma and senile cataract are eye conditions which have much higher incidence in the older age groups (see Table VII), it is evident that a portion of the 51 per cent in the item, *Unknown to Science*, must be attributed to the increase in population of 50 years and over between 1940 and 1950. However, adjustment for this

TABLE VII. INCIDENCE OF GLAUCOMA AND CATARACT BY AGE GROUP
Computed from Cases Reported
in New York in 1950

Cause Group	*Rate per 100,000 Population*			
	Total 18 Years and Over	*18–49 Years*	*50–64 Years*	*65 Years and Over*
Glaucoma	2.77	.41	3.41	14.16
Cataract (senile)	3.36	.23	2.61	21.63

TABLE VIII. PER CENT OF BLINDNESS DUE TO GLAUCOMA AND CATARACT
Current New York Data Compared with
Previous Estimates as of 1940

Group	*Per Cent of Total*	
	Glaucoma	*Cataract (senile type)*
Cases reported in New York		
1948	17.1	18.2
1949	15.7	18.3
1950	15.4	18.4
Average—3 years	16.0	18.3
Average for all groups studied, as of 1940	11.1	15.9

factor would reduce the percentage only slightly—to about 45 per cent. Hence it appears likely that the rates of incidence of the eye conditions included in this category may have also increased since 1940.

Increase in Glaucoma and Cataract

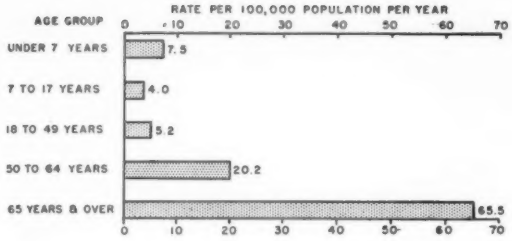
As additional evidence of this trend, it will be seen (Table VIII) that among new cases reported in New York during the past few years, both glaucoma and cataract account for higher percentages of the total cases than the average previously estimated for all groups studied in 1940. We are dealing here with percentage distributions which show only the importance of various causes in relation to the total. The incidence of glaucoma and senile cataract by age group for the year 1950 is shown in Table VII.

Similar Trends in Other Data

The limited evidence available from other states supports the picture of the changing pattern seen in the New York State material.

Increase in Blindness from Retrolental Fibroplasia

State agencies for the blind and medical centers all over the country



Blindness Rates in New York State, By Age Group

Incidence Rates Based on Cases Reported in 1950

report a large influx of cases of blindness due to retrolental fibroplasia in premature infants, starting about 1944. No accurate count of cases has yet been made, but the National Society for the Prevention of Blindness is working with other groups to study the problem. The number of cases of retrolental fibroplasia is known to be very large in several states, but it appears that in some states few if any children are affected. It is certain that this one affection of the eye has already materially increased the number of blind in the infant, preschool and early school age groups in the United States. These facts confirm one conclusion reached in the analysis of the New York data—the rate of blindness among children is now considerably above the rate estimated as of 1940, the increase being apparently due to retrolental fibroplasia.

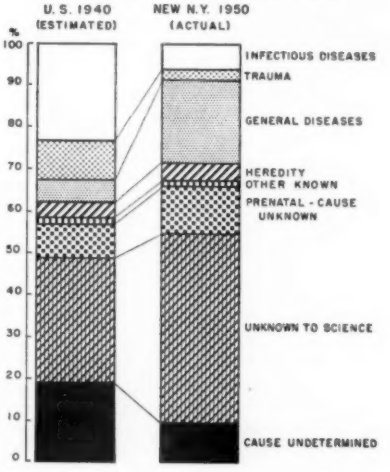
Trends at School Age Level

Cause of blindness data for the school age group, compiled routinely for the Committee on Statistics of the Blind, provide conclusive evidence of the trends noted in the child age group. For example, our report covering children enrolled in residential schools and day classes for the blind in 1939–40 showed 24 per cent of the total to be due to *Infectious Diseases*, whereas by 1949–50 the figure had dropped to 14 per cent for the total enrollment, and to 9 per cent for children admitted for the first time in that year.

The data for the school age group show a downward trend also in cases due to *Injuries*. As of 1939–40 the percentage was 8, in 1949–50 it was 7 and, among new admissions only, it was 6. Although this change is not as dramatic as that noted for New York (see Table VI), the trend is in the same direction.

In the school figures we also see the upward trend in cases of *Prenatal Origin*—from 51 per cent of the total in 1939–40, to 64 in 1949–50, and to a little over 65 per cent for new cases.

Distribution of Blind By Cause of Blindness U. S. in 1940 vs. N. Y. in 1950



An upward trend can be demonstrated for the *General Diseases* group, the respective percentages as above being 1.2, 1.5 and 2.9.

The one cause group for which our over-all school data do not show the downward trend as seen in the New York figures is *Tumors*. The nationwide figures appear to be increasing (from 3 per cent in 1939–40 to 5 per cent in 1949–50 for the total and to over 6 per cent for new admissions). However, it is possible that at least a portion of these cases were retrolental fibroplasia cases diagnosed as probable tumors. Unless biopsy or enucleation with microscopic study of the tissues is done, confusion of the two affections is possible.

Data on Adults from Other States

We have found very little statistical data on the adult age group available for use in testing out the validity of conclusions drawn from the New York material. Only four states have supplied us with data for a recent year which can be compared with the findings of an earlier study. They are Arkansas, Kansas, Missouri, and New Hampshire.[6, 7, 8, 9] In all four the changes noted are less marked than those seen in the New York figures, but this is due to the fact that data for the more recent years cover all cases on register and not just the new cases as in New York. To illustrate: even in recent years the per cent due to *Infectious Diseases* in Missouri and Arkansas will seem very high unless we remember that the rolls still include many individuals blinded by trachoma decades ago when the incidence rates for this disease were very high.

These data in general confirm the trends noted in New York. This fact is shown by the figures in Table IX, in which it will be seen that the direction

TABLE IX. TRENDS IN CAUSES OF BLINDNESS AMONG ADULTS IN FIVE STATES

State	*Date*	*Per Cent of Adult Cases* Due to*				
		Infectious Diseases	*Injuries*	*General Diseases*	*Unknown to Science*	
					Total	*Glaucoma*
New York	1939	29.3	8.6	4.1	25.6	11.3
	1950	6.1	2.5	22.2	51.1	15.4
Arkansas	10/41	39.2	14.8	3.5	27.6	11.6
	4/48	31.0	11.4	3.7	28.9	12.9
Kansas	11/40	21.6	8.0	8.7	47.0	8.7
	6/48	14.4	6.2	5.0†	55.9	8.3
Missouri	3/44	32.1	11.5	2.5	30.3	18.9
	11/50	27.2	10.6	3.7	32.4	20.7
New Hampshire	11/40	14.8	12.2	7.2	37.2	13.5
	12/48	9.8	9.5	6.3†	44.9	13.9

* All figures are for adult recipients of aid to the blind, except those for New York as of 1950 and Kansas as of 1948, which cover all adults on the register of the blind.

† Note that the direction of the change is opposite to that in New York.

of the changes occurring in other states is the same as in New York, with two exceptions. Both Kansas and New Hampshire show decreases rather than increases in blindness due to *General Diseases*. However, both states have rather large groups still classified as *Undetermined* or *Not Specified* (Kansas 15.5 per cent; New Hampshire 20.3 per cent).

The figures for glaucoma in these states are also of special significance. Only the Kansas figures remain low (about 8 per cent). The glaucoma figures of the other states all seem to confirm the fact, noted in the New York data, that the percentage of adult blindness due to glaucoma may now be considerably higher than the 11 per cent average for 1940.

Incidentally, the blind on the 1948 register for New Hampshire included 5.5 per cent of child age (under 20 years), which is above the figure estimated for the United States as of 1940, but less than the percentage on New York's register as of 1950.

Summary and Conclusions

New data on the blind from the New York Commission for the Blind suggest that there may be need to revise our concept of the extent and causes of blindness in the United States. Although comparable data from other sources are still very limited, it is to be noted that the available studies are in substantial agreement. Hence, the following trends, as seen in the study of the cases reported in New York in recent years, appear to have special significance:

The relative importance of various causes has shifted and the rate of blindness is increasing at some age levels while decreasing at others.

Causes of blindness which have shown a marked downward trend and are continuing to decline are the *Infectious Diseases* and *Injuries*. The New York data provide evidence that efforts to reduce these hazards to eyes are proving even more successful than had been thought. This excellent showing must be credited both to public health and safety measures and to the greater efficacy of the newer drugs. Basic controls cannot now be relaxed. A good record can be maintained and surpassed only if constant vigilance is exercised to prevent exposure to infection and injury and if effective modern therapy is available for use whenever eyes are threatened.

Blindness due to the *General Diseases* (chiefly diabetes and vascular diseases) is definitely increasing in New York. One of five new cases of blindness reported annually is due to such causes, which now rank first among known causes. The number is increasing from year to year and will undoubtedly continue to do so unless methods of prevention and treatment appropriate to each systemic disease affecting the eyes can be determined and applied. Further medical research into the problems of aging is essential to effective prevention of blindness in the older age groups. Of paramount importance also is early diagnosis and treatment before a disease has produced degenerative changes which cannot be reversed.

By far the most serious problem in prevention of blindness is that due to those eye diseases and defects, the etiology of which is unknown. Always the most frequent causes of blindness, the incidence rates for this group of eye affections are increasing. These eye conditions accounted for almost 60 per cent of the new cases of blindness reported in New York in 1950. They affect particularly persons at both ends of the life cycle. Retrolental fibroplasia

in premature infants and glaucoma and cataracts in persons beyond middle life are the most important causes. This situation points to the urgent need for an accelerated research program to determine causes and best methods of prevention.

When the data were analyzed by age group it was found that blindness is increasing at all age levels except adults of 18 to 49 years. The figures for the latter age group reflect the decreases in blindness from *Infectious Diseases* and *Injuries*, and these decreases are not being offset by an increase in affections of the eye in which etiology is unknown, as is the case for the younger and older age groups.

Time is an important factor in the battle against blindness. To the extent to which the causes and methods of prevention are known, the passage of time can insure more and more effective use of this information. But, when knowledge is lacking, time works against us by increasing the size of the problem. Time and effort devoted now to medical research which will fill the gaps in our knowledge should prove enormously rewarding in the future.

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A Vocational Training Program for Partially Seeing High School Students*

Dorothy R. Hartman, *Sight-Saving Class Teacher*

Edward Bok Vocational-Technical School, Philadelphia, Pa.

THIS article describes how partially seeing pupils in the Bok Vocational-Technical School in Philadelphia train for profitable employment.

Background

"EACH child shall be educated in keeping with his capacities, limitations, and interests, looking toward the happiest adjustment he can make in life and the most constructive contribution he can bring to society."† In line with the acceptance of this basic philosophy, the Philadelphia public school system has made considerable progress in serving the needs of its mentally and physically handicapped children.

Since the first sight-saving classes were organized in Philadelphia in 1919, a flexible, forward-looking program has been evolving. From the very beginning, the need for preparing these pupils for earning a living was recognized. A review of the history of these classes in Philadelphia reveals that relatively few of the pupils have completed an academic high school course. Since no class had ever been organized at the secondary level, little help had been provided for these young people. Only a rare student with outstanding ability and initiative had succeeded. A survey showed that many former pupils were in jobs not suited to their capacities, or in jobs where vocational training would probably have been of value in helping to stabilize the employment. Many had drifted from one odd job to another, not having specific training for any particular vocation.

During the school year 1944–1945, ten ninth-grade partially seeing pupils of the W. & E. Martin School were sent to the Bok Vocational-Technical School for trade exploratory courses each afternoon, the academic program being provided in the elementary school. While they gained much from this experience, cooperation between the two schools being excellent, many problems arose which made such a plan impractical. The fact that the schools are widely separated made

* Photographs in this article through courtesy of Mr. Jessie Hartman, Philadelphia, Pa.

† Dr. Elise Martens, former Senior Specialist, Education of the Handicapped, Washington, D. C.

transportation a serious problem. The adjustment of the pupils to the programs of two schools was difficult as they did not really feel part of either school. They were unable to share in extra-curricular activities necessary to their full development.

The need for definite vocational training for pupils with partial vision was then clearly recognized and representatives of educational, medical, and social fields were called together in a series of conferences to consider the many facets of the problem. Data concerning former pupils and their employment experiences were collected and discussed. Each member shared his knowledge and experiences as the group planned a program designed to meet the needs of partially seeing students for vocational training.

A study was made of available facilities in the Philadelphia school system for possible vocational training of these pupils. After a series of discussions and consideration of the various aspects of the problem, it was decided to establish a special class in a vocational school. These were the goals for the program as stated at that time: (1) occupational preparation for visually handicapped pupils of secondary school age; (2) opportunity for these pupils to grow in an environment provided for pupils of secondary school age; (3) recognition of fields suitable for these pupils.

The primary goal—occupational preparation—justified the placement of the class in a vocational school. The purpose was to provide these pupils with opportunities for training which it was hoped would prove vocationally significant.

After considering the various vocational schools in the city, the Edward Bok Vocational-Technical School was selected, partly because of the interest displayed by the vice principal in charge of curriculum and because there was space for the pupils in various shops. Bok is a three-year secondary school divided into six terms which correspond to grades 10A to 12B in many secondary schools. The pupils spend three hours daily in the shops and another three hours in associated subject matter classes.

A teacher trained to teach the partially seeing was detached from the elementary sight-saving class center to supervise the program and to teach the associated subjects. She still remains on the elementary school payroll and is not, therefore, a faculty addition to the vocational school budget. This permits the class to be conducted for a smaller number of pupils (usually 14) than would be required if her salary were charged against the vocational school payroll. The parent school carries the necessary pupil load for her.

Selection of Pupils

The class was first organized with the 15 pupils of the Martin School who were fifteen or sixteen years of age, with no attempt at selection. Experience has shown that some pupils are not interested in vocational training and some, because of social or mental immaturity, are not ready for it. A finer screening, therefore, is now done before the pupils are selected for the class at the vocational school.

While in the ninth grade, the pupils are tested by the school psychologist, who recommends either further training in the academic high school or in a vocational school or, in the case of a slow-learning or immature pupil, the

termination of his education in the parent school. The ophthalmologist tests the vision of each student and makes recommendations regarding further education. He may restrict eye use in the classroom and limit activities in the gymnasium at the secondary school. He also serves as a consultant for the teacher of the partially seeing at Bok.

The special teacher at Bok holds a conference with the ninth-grade pupils and teachers to explain the opportunities offered. Several partially seeing pupils attending the vocational school join this conference and share their experiences with the prospective pupils. A visit to the vocational school for the interested pupils is arranged and their parents, too, are encouraged to visit the school.

Permission is obtained from the parents for the pupils to be transferred to the Bok School. Since elementary pupils in classes for the physically handicapped have free bus transportation which is not available to the secondary pupils, this and other incidental expenses of attending a secondary school present a problem to some parents.

On the regular testing day each term, when prospective pupils apply for admission to the vocational school, the partially seeing pupils also apply. This testing program consists of: (1) review of each pupil's school records; (2) test in arithmetical skills and understanding; and (3) interview by the shop teachers and the teacher of the partially seeing.

Upon an evaluation of the findings and the number of openings in each trade, depend the admission and placement of pupils in the vocational school. With the exception of the written test which is given to them in primer type, partially seeing pupils follow the usual procedure for admittance. Bok, however, has been most generous and considerate in giving these pupils opportunity for training in their chosen vocations, upon the recommendation of the sight-saving class teacher.

Activities of the Teacher of the Partially Seeing

The teacher of partially seeing pupils is also the homeroom adviser for the group and serves in many ways to help the pupils make the best possible adjustment in the Bok Vocational-Technical School. Her position is one of counselor, roster maker, associated subjects teacher, and interpreter of the program to various members of the school staff and to the parents of the pupils involved. After evaluating each pupil's records and interviewing him concerning his plans, she guides him in the selection of a course. Complete freedom has been given the special teacher in placing a pupil in the selected shop, and opportunity is provided to transfer him to another shop during the term if this is deemed wise.

In organizing the class each term, the special teacher first determines when each partially seeing pupil should be assigned to the shop, attempting to divide the group in half for associated subjects. Since the group is usually made up of pupils having different shops and at different term levels, the associated subjects program is adapted to the particular pupils involved. The pupils are then assigned to physical education (with the recommendations of the ophthalmologist), hygiene, music, and other available minor subjects, with the regular pupils of the same term level.

"What Does That Word Mean?"—Pupil referring to large print dictionary for meaning of word read in regular type book using Projection Magnifier

The major associated subjects, including English, mathematics, social studies, and typewriting, are taught in the sight-saving classroom by the special teacher who has the responsibility of adjusting the courses to meet the needs of the partially seeing pupils. Full use is made of the instructional material available. Through her contacts with the teachers of the regular pupils, the special teacher makes the program of the special pupils just as rich as possible and provides opportunities for frequent contacts with the regular pupils.

Associated Subjects Program

The special classroom has been painted and arranged according to the needs of the partially seeing pupils. It is equipped with adjustable desks and has large-type typewriters for the use of both pupils and teacher in the preparation of materials. Three Talking Books, two of which were donated by a friend, are at the disposal of this class. Audiovisual equipment, including an opaque projector and a sound movie projector, is regularly used. A Projection Magnifier, an instrument which magnifies printed material five times, developed by the Research Department of the Franklin Institute, Philadelphia, for the Kellogg Foundation, is being tried out by these pupils. They are finding it useful in reading regular print texts, newspapers, and magazines.

The problem of obtaining suitable textbooks for use by these pupils is a serious one. Some in fairly large type can be used to supplement the few large-type books printed for secondary school pupils. It is the responsibility of the special teacher either to read the material to the class or to give an abstract of it when none is available in suitable print. The policy of giving a minimum of eye work and a maximum of oral instruction and discussion is followed throughout the program. Periods of eye use are alternated with periods of oral instruction. The texts in use throughout the school for normally seeing pupils are used by the teacher for reference and for the adaptation of courses to the needs of the partially seeing pupils.

The teaching-learning situation is established through unit teaching based on life situations and shop experiences. Since the instructional groups are very small, much individual teaching is possible. A very close relationship is maintained between pupils and teacher, thus creating an atmosphere conducive to the development of well-rounded personalities. Of necessity, the courses taught each term are determined by the particular pupils involved and vary according to their interests and needs.

Typewriting instruction is continued until the students are able to

use this skill in the preparation of their school work. It is not considered as a vocational possibility for them but as a means of sight conservation. Instead of the usual typewriting text, a series of lessons prepared by the teacher on charts 22″ x 28″ is hung on easels separated from the typing tables. The students progress individually at their own rate of speed until the keyboard is mastered. Rhythm and good typing habits are pleasantly developed by the use of regular typing records during drill periods. Many of the pupils realize great satisfaction by being able to type their class notes and home assignments. The typewriting periods are planned to allow practical application of the skill after the pupils have mastered the touch system.

The sight-saving class teacher regularly types instructional material in large type for the students' use in their shop or other classes.

In the vocational school the counselor is of invaluable help to this special group. Under the counselor's guidance, the special teacher has gradually assumed more responsibility for advising and scheduling the partially seeing pupils. Innumerable informal as well as formal conferences have been held with teachers, parents, and, occasionally, employers, regarding the adjustment of these pupils. The counselor has been most cooperative and has given generously of her services in helping to organize and conduct this program.

Shop Program

There are approximately 30 different vocational courses taught at the Bok Vocational-Technical School. Since many of these require normal vision and call for considerable eye use, they are not suitable for partially seeing pupils. These pupils are guided into shops where they will have an opportunity for training according to their abilities, interests, and visual possibilities. Without exception, the shop teachers have been most sympathetic and understanding as they have worked with these students. Since the shop teachers are free to call upon the sight-saving class teacher for advice and know that the students can be transferred to another shop if this seems wise, an objective approach is maintained in teaching each one on an individual basis. The special teacher is encouraged to observe the partially seeing student at work and is frequently consulted regarding his progress.

The shop teachers have developed an understanding of how much can be done despite the visual handicap. As the teachers have become more familiar with the work of these students there is less hesitation to having them

"I Want To Be a Sheet Metal Worker"—Pupil working on job in Sheet Metal Shop

in the shops. The shop teachers' sincerity and interest in the problem have helped the young people profit greatly by the shop training. The teachers, in turn, have commented upon the sincerity, work habits, and general attitude of the partially seeing students.

Many of the students have had experience in two shops before selecting one for their vocational training. For example, several boys tried the woodwork course, but it was found that the electrical equipment in the shop as well as in industry makes this work too hazardous for the typical partially seeing student. Two girls changed from Restaurant-Practice to Child Care at end of first term and were graduated from this course.

The courses in which partially seeing students have experienced the greatest success thus far are: (1) child care; (2) restaurant practice; (3) automotive maintenance; (4) sheet metal work; and (5) painting and decorating.

Child Care

A modern nursery serves as a laboratory for the girls in the child-care course. Here is found a typical group of two- to four-year-old youngsters, which the girls are given an opportunity to guide through a well-planned daily routine. They observe and assist in the play, eating, sleeping, dressing and toilet periods. Through observation and in classes in theory, they become familiar with the mental, physical, social, and emotional growth of young children. Opportunity is also given for field experience in child-care centers, kindergartens and children's hospitals. This practical work is of great value in broadening the girls' experience and in giving them opportunity to apply their knowledge.

Luncheon in the Nursery—Child Care student getting practical experience with children in Bok Nursery School

Graduates may obtain employment in child-care centers, private homes, or in child-care institutions. Several partially seeing graduates have been successful in child-care centers or in private homes.

Restaurant Practice

This course trains boys and girls to prepare and serve food in large quantities. A teacher's tearoom provides practical experience in the trade. During the course practical aspects of management, buying, pricing, accounting, taking inventory, handling personnel and planning equipment are considered. Graduates have obtained various positions in the restaurant trade, such as waitress, cashier, food checker, cook, baker, or hostess. Partially seeing students have been employed as waitresses, salad girls, or bus girls.

Automotive Maintenance

The purpose of the automotive maintenance course is to give the student a thorough basic training in the general principles, construction,

Apple Pie for Teacher Today—Pupil preparing for Teachers' lunch using recipe typed by Sight-Saving Class teacher, Dorothy R. Hartman

and servicing of an automobile. This includes lubrication, front end and steering alignment, brake service, engine, clutch and transmission maintenance, electrical diagnosis and correction, engine tuneup and carburetor adjustment, body and fender straightening, and refinishing. One partially seeing student works part time in a garage.

Sheet Metal Work

The course in sheet metal work is a comprehensive one, including layout, development, cutting, assembling, and installing of all types of sheet metal.

One partially seeing pupil has been graduated from this course and is employed in a factory where metal tool kits are manufactured.

Painting and Decorating

In this course the pupil learns to use the various tools and materials of the trade and he is given practical experience in painting walls and woodwork, and in refinishing furniture.

One partially seeing boy who is taking this course had a work-experience job in a wallpaper concern. He worked one-half of each school day and on Saturdays, mixing custom-made paints according to formula. Since the paints were mixed mechanically the boy did not come into too close contact with them. One first-term pupil who was not interested in the work in the sheet metal shop transferred to the paint shop and is doing an excellent job. It still remains to be seen whether paperhanging is practical for these students.

Extracurricular Activities

In the fulfillment of the second goal, opportunity for these pupils to grow in an environment provided for secondary-school pupils, the partially seeing pupils share in many of the activities

"We'll Do Your Paint Job"—Pupils practicing on model house in paint shop at Bok Vocational

RECORDS OF PUPILS WHO HAVE BEEN GRADUATED

1948–1951

Case	*I.Q.*	*Eye Diagnosis*	*Course*	*Employment*	*Time on Job*
1.	122	Cong. Amaurosis Myopia Palsy O.D. 20/70 Nystagmus O.S. Light	Child Care	Only teacher in a private day nursery	1½ years—until marriage
2.	81	Malignant Myopia Alter. exotropia 20/200 20/600	Child Care	Ass't teacher in city child-care center in public school	3 years (still employed)
3.	91	Albinism Myopia Nystagmus 20/70 20/100	Auto. Maint.	Shipping Clerk	3 years
4.	70	Optic Atrophy Nystagmus 20/100 20/70	Rest. Prac.	Waitress in hotel in Atlantic City	3 months—until marriage
5.	67	Nystagmus Refractive error 20/50 20/40	Child Care	Caring for child part-time in private home	Married upon graduation
6.	65	High Myopia 20/70 20/40	Child Care	Caring for child in private home	1 year
7.	104	Albinism Nystagmus 20/200 20/200	Sheet Metal	Metal products company	Employed 6/25/51
8.	88	Interstitial Keratitis 8/200 20/200	Rest. Prac.	Cafeteria worker in public school	Employed 9/30/51
9.	91	Corneal Opacities 20/100 20/100	Rest. Prac. (1 term) Child Care (5 terms)	Ass't teacher, community day nursery	Employed 6/4/51
10.	87	Albinism Nystagmus 20/200 20/200	Rest. Prac. (1 term) Child Care (5 terms)	Employment in private home	7/1/51

provided at Bok. They participate in the Glee Club, Dramatics Club, Bowling Club, Baton Twirling, Band, Swimming, Track, and in the Lunch Squad. One boy, with the ophthalmologist's permission, is on the football team. It has been gratifying to see these pupils enjoy their school life and feel at home in Bok. Since the school is one of the younger secondary schools in Philadelphia, the partially seeing pupils have shared in building up a fine school spirit.

Evaluation of Program

The results of such a flexible program designed to meet the needs of a particular group of pupils are difficult to measure and express objectively. So much of growth and development is intangible. Perhaps one way to check on the degree of success is

through the observation of the records and experiences of some typical pupils who have participated in the program.

Although many of the group did not complete their course, it is strongly felt by those concerned that they have, nevertheless, profited much by the opportunities offered at the Bok Vocational-Technical School. It did not appear that the visual problem was the direct cause of dropping out; the more apparent reasons were concerned with matters of adjustment to the school program or financial need. Since Bok is quite a distance from many of the pupils' homes, in some cases over an hour's traveling time each way, this may have been a contributing factor.

Implications for Future of Program

After six years' experience in working out a program planned for the partially seeing pupils in a vocational school, it is realized that there is much room for further improvement. The participating students and their parents have been well pleased with the growth of the program and it is sincerely hoped that this will continue to develop as it seeks to fit the changing needs of these young people. The following suggestions indicate the direction in which progress should be looked for:

1. Broadening of shop experiences to include a larger number of vocational courses. Perhaps the students may be able to specialize in certain parts of a trade which do not require excessive use of vision. This, of course, depends upon the abilities and interests of future students.
2. Greater contacts through the associated subjects program with the regular students of the school.
3. Development of more instructional material in suitable type and content to parallel that used in regular classes.
4. Wide use of mechanical aids, such as the Talking Book and the Projection Magnifier in instruction.
5. Development of reader services for those desiring it.
6. Broader contacts with industry and placement agencies.
7. More effective follow-up of former students.
8. More effective means of interpreting program to prospective students in the interest of better placement in the vocational school.

Forty-two pupils have participated in the program thus far, including ten who have been graduated, two transferred to other schools, and nine still on roll. The progress has been due to the wholehearted interest and cooperation of many persons in the Philadelphia public school system in attempting to meet the needs of these partially seeing students in a vocational school with an enrollment of 2400. The interest and help of the principals and counselors of both the elementary and vocational schools in organizing and developing this program have been equally matched by the cooperation of the shop teachers at the Edward Bok Vocational-Technical School. In view of such evident success of the vocational program with these first groups of partially sighted pupils at the secondary level, further development seems practical and promising.

The Forum

THIS section is reserved for brief or informal papers, discussions, questions and answers, letters, and occasional pertinent quotations from other publications.

A Salute to Inventor of Protective Eye Wear

Mrs. Gilday, a veteran industrial nurse for the Unit Drop Forge Division of Fuller Manufacturing Company, is convinced that a special tribute and a twenty-gun salute should be given to the inventor of protective eye goggles. Before the advent of protective eye wear, Mrs. Gilday was an industrial nurse in a large West Coast shipyard which employed more than 9,000 workers during the First World War. She was assigned to the eye service. For six years, for eight hours a day, she stood at the treatment chair removing foreign bodies from eyes, and giving first-aid care. Many of the eyes were so badly injured that they could not be saved. You see, the work of the yard was mostly chipping and riveting. Surely Mrs. Gilday is qualified to speak.

The eye safety program in her present job was started in 1938, but at first the employees were not too interested. They "wore" the goggles in their pockets, left them in their lockers and many times they were on the workbench beside the worker. Management did not insist that the worker wear his goggles, but took a lenient attitude, saying "we wish you would wear them."

Of the 300 employees getting foreign bodies in their eyes, usually there were about 75 requiring first-aid care. Most of these were for the removal of foreign bodies, but there were always at least 8 to 10 men who had sufficient eye impairment to require prolonged eye care from an ophthalmologist.

Eye Protection Inaugurated

It was not until 1943, when one of the hammermen lost the sight of both of his eyes, that a really decisive stand was taken about wearing safety goggles. Since that time it has been a "MUST" and a condition for employment—no goggles, no job.

Now practically all of the employees wear safety goggles, most of which are of the side shield type. In the grinding department, however, they may be the cup type of goggle.

Each new employee is issued goggles with instructions on how to wear them. He is cautioned to wear them at all times in the plant. Individual

selection of the goggles is permitted and, wherever possible, the worker is given as much choice as can be safely permitted.

Today the number of eye cases requiring the care of a specialist has been reduced to five or six in the course of a year. There is still a need to remove an occasional foreign body since it may get in around the goggles, but usually it is easily removed.

The age-old objections—the goggles are too heavy and "they give us a headache"—have disappeared. In fact, many of the workers have become so accustomed to wearing goggles that many leave for home, forgetting to remove them.

Vision Screening Helps

The addition of a vision screening program has helped too, since the plant has its share of aging employees who used to guess what they were doing rather than see what they were doing. The typical comment from such employees was: "I've done this work so long I don't have to see, I just know the distance and I put the steel there." This resulted in many mashed fingers and hands, as well as burns. Today all the employees are screened and prescription glasses are provided. After they receive their regular prescription glasses, employees are properly fitted with safety prescription goggles. The men were amazed at how much easier and safer their work is and the decrease in accidents and spoilage has been remarkable.

Nurse Plays Important Part

The nurse in an industrial plant can really do a great deal to help the safety goggles program. In her contacts with the workers she should utilize every opportunity for teaching the worker the purpose of the safety goggles and what it means to him to wear them in the plant.

The nurse can give guidance in the selection of safety goggles and wherever possible she should help the worker select the goggle that is going to give him the greatest protection.

The maintenance of the goggles is a most important factor in a successful safety goggle program. The nurse is in a strategic position to see that the goggles are cleaned, properly sterilized, kept in good repair and properly stored. All of these factors are essential to a well executed eye safety program.

Surely there can be no greater satisfaction than to know that the job you have done has helped the employee save his eye.

H. E. W.

Education of Partially Seeing Children

Editor's Note.—The letter below is published as an example of how one superintendent of a school for the blind handles a vexing problem. The National Society for the Prevention of Blindness for many years has urged that state and local departments of education provide facilities for partially seeing children in their own communities. Too often such agencies seem content to shift the burden to a state institution. By stating the facts and declining to accept responsibility for education of such children for the indefinite future, this superintendent helps to make communities of adequate size face the challenge where they should—right at home.

Dear Mr. ————:

Thanks for your good letter indicating your interest in the problems of the two fine Midfield youngsters. I am glad also to learn that you are a Lion.

I feel you and our fellow Lions of Midfield might help in your area with a problem that cries for attention at an early date.

Partially sighted children such as Charles should not be educated in schools for the blind unless they live in such isolated areas that it is impossible for them to have special instruction in their own districts. We believe that school administrators have not established these classes in the more populous areas because of their lack of information about the need or their fear that their local districts will resent the more fictitious than real tax increase that might be necessary. It is neither fair to the blind child in his school to be crowded out by partially sighted children nor to the partially sighted child to be placed in an institution intended for and primarily geared to blind children. The cost of education of a blind child in a residential school is about $1800 per year. The number of blind children in Missouri eligible for entry into the Missouri School for the Blind is about 150. It stretches our capacity to handle this number. There are approximately 1200 children of school age in Missouri whose education and sight security require the services of sight conservation classes in their local schools. Where sufficient numbers of such children are present to establish such classes, the state of Missouri will compensate the district establishing the class to the extent of $225 of state aid for each pupil eligible for such a class and enrolled. Where a fairly large number of pupils is available, this is adequate to cover the cost with *no* additional cost to the district but a real saving to the taxpayers of the state.

It is grossly unfair to the child to take him away from the influence, love and security of his home in his early years if it is unnecessary. It is grossly unfair to the taxpayers of the state to spend $1800 per year on the education of a child who could be more happily educated in his home district at a cost of about $225 per year.

Most school superintendents think they do not have enough children to justify the establishment of sight-saving classes. They are only aware of those extreme and borderline cases who just *can't* make it with regular print books but are not "Braille" pupils. These superintendents are not aware of the larger number of children who, by sheer perseverance and courageous pursuits of their desire for learning, have labored under adverse conditions and at the cost of permanent injury to their sight. In addition to this, many such pupils have become unnecessarily disciplinary, social, or prematurely terminal cases. Much teacher and pupil time and patience have been inefficiently used.

Now, in regard to Charles, we have no responsibility for his education at all. Ernest should be educated here in the light of his present eye condition. We are taking Charles this year because no provision has been made for him by his own home school system. However, this is purely a kindness on our part. I feel very strongly that the day is here when this type of problem must be faced squarely and met by the residents of the local districts.

There are sufficient children in Midfield to establish at least one sight conservation class. Plans should be initiated immediately to assure your superintendent that the community desires this service and is willing to

pay the increased cost *if there is any increase*, which is doubtful when the state aid is taken into consideration. We hope such a class will be available for Charles in his own community next September. We will not enroll him next year unless his sight has deteriorated.

If I can be of assistance in any way, I shall be happy to do so.

Yours in Lionism,

Missouri School for the Blind

ROBERT H. THOMPSON (signed)

Superintendent

Resignation of REVIEW Editor.—We report with deep regret that Miss Isobel Janowich, editor of the SIGHT-SAVING REVIEW since its inception, is leaving the Society on December 31, 1951. Miss Janowich, who is Mrs. David Resnick in private life, is joining her husband in his public relations firm in New York City. Fortunately, she has consented to serve for a time as consulting editor. With this volume, the SIGHT-SAVING REVIEW completes its twenty-first year; thus Miss Janowich has the satisfaction of having brought the journal to vigorous maturity. Miss Janowich will be greatly missed both professionally and personally by her friends in this country and abroad.

FRANKLIN M. FOOTE, M.D.

Around the World

International Covenant on Human Rights

One of the most significant social documents of our time is the International Covenant on Human Rights written by the United Nations Commission on Human Rights. The recently revised draft of this Covenant includes several articles relating to economic, social, and cultural conditions of considerable interest and import to prevention of blindness workers throughout the world.

The following remarks are meant to suggest some of the possible implications of the Covenant in prevention of blindness programs wherever they are.

"*Article 21.* The States Parties to the Covenant recognize the right of everyone to just and favourable conditions of work, including:

(a) Safe and healthy working conditions;

. . . . . ."

In accord with this generalized heading there obviously should be included provision of such items as: preemployment eye examinations; environments in shops, factories, and offices that are adequately decorated and illuminated; goggles and other forms of eye protection in accord with the demands and hazards of the job involved; adequate first-aid and emergency facilities.

"*Article 25.* The States Parties to the Covenant recognize the right of everyone to the enjoyment of the highest standard of health obtainable. With a view to implementing and safeguarding this right each State party hereto undertakes to provide legislative measures to promote and protect health and, in particular:

(i) to reduce infant mortality and provide for healthy development of the child;
(ii) to improve nutrition, housing, sanitation, recreation, economic and working conditions and other aspects of environmental hygiene;
(iii) to control epidemic, endemic and other diseases;
(iv) to provide conditions which would assure the right of all to medical service and medical attention in the event of sickness.

"*Article 26.* The States Parties to the Covenant recognize that:

(1) special protection should be accorded to maternity and motherhood; and
(2) special measures of protection should be taken on behalf of children and young persons, and that in particular they should not be required to do work likely to hamper their normal development."

Prevention of blindness activities are logically a part of all sections of these articles, particularly provisions

for: premarital blood testing; prophylactic treatment of the eyes of the newborn; periodic eye examinations of school children and adults; legislation regulating the sale of fireworks and BB guns; control of communicable diseases affecting the eye, notably trachoma, tuberculosis, smallpox, gonorrhea, and syphilis; improvement of visual conditions in homes, schools, and factories; and medical, clinical, and hospital facilities within the geographical reach and financial scope of all citizens.

"*Article 28.* The States Parties to the Covenant recognize:

(1) the right of everyone to education;

. . . . . ."

Nowhere in the report is mention made of the exceptional child. Throughout, the handicapped child is considered to be first and foremost a child, meriting the same considerations to be accorded all children. Partially seeing children are included by both inference and implication in this statement and have thereby the right to receive an educational opportunity equivalent in all respects to that provided for the so-called normal individual.

Note and Comment

William H. Crisp, M.D., 1875-1951

THE REVIEW has lost a mentor and friend in the death of Dr. William H. Crisp, a leader in ophthalmology and in prevention of blindness. Dr. Crisp has been a member of the Board of Editors since April, 1943. Through the years no question was so small, no request so great that he did not give us the benefit of his wisdom and experience and richness of spirit.

Grants for Eye Research

The National Society for the Prevention of Blindness has recently made grants totaling $12,442, for the study of eye diseases and defects which can lead to blindness.

The Massachusetts Eye and Ear Infirmary, Boston, received a grant of $2,000 to help study the possibility of using metal or plastic substitutes for living corneas in the famed corneal transplant operation. The Infirmary was also awarded $1,000 to aid a study on treatment for detached retina.

Western Reserve University, Cleveland, received $1,600 for research on cortisone in inflammatory eye diseases, effect of methyl alcohol on eye tissues, and eye nutrition. Western Reserve was also awarded $1,500 for a study on cataract development in the eyes of some diabetic persons.

The Washington University School of Medicine, St. Louis, received $1,842 for glaucoma research.

The McMillan Eye Clinic, also of St. Louis, was given $1,000 to make a survey on the treatment of crossed eyes at various eye centers in the U. S.

The New York Eye and Ear Infirmary, New York City, received $1,000 for research in uveitis.

New York University—Bellevue Medical Center, New York City, was given $2,500 for research in retrolental fibroplasia of prematures.

A portion of the funds in the Western Reserve and Washington University grants came from a New Jersey organization, New Eyes for the Needy.

Glaucoma Film for the General Practitioner

The National Society for the Prevention of Blindness announces the release of its new motion picture, "Glaucoma: What the General Practitioner Should Know." The film, made through a grant from the W. K. Kellogg Foundation, is a 16 mm. sound film in color, and runs 22 minutes. It was prepared under the scientific direction of the Society's Committee on Glaucoma: Willis S. Knighton, M.D., New York City, Chairman; Francis H. Adler, M.D., Philadelphia; Eugene M. Blake, M.D., New Haven; Frederick C. Cordes, M.D., San Francisco; John H. Dunnington, M.D., New York City; Edwin B. Dunphy, M.D., Boston; E. Bruce Fralick, M.D., Ann Arbor; James N. Greear, M.D., Reno; Peter C. Kronfeld, M.D.,

Chicago; Jay G. Linn, M.D., Pittsburgh; Lawrence T. Post, M.D., St. Louis.

After presentation of statistical facts about glaucoma, two cases are described—one a man with acute glaucoma, the other a woman whose case is chronic. The effect of increased pressure on the various parts of the eye is shown diagrammatically. The technique of tonometry, using the Schiøtz tonometer, as well as a simple test for field of vision, is shown. The film shows specifically the responsibility of the general practitioner for recognizing glaucoma and referring the patient for ophthalmologic care.

This film is especially designed for showing at general practitioners' meetings, state and county medical societies, to hospital staffs and other specialized audiences. It is available without charge except cost of transportation, with the understanding that an ophthalmologist will be present at the showing to introduce the film and answer questions. For reservations or other information, write to the Committee on Glaucoma, National Society for the Prevention of Blindness, Inc., 1790 Broadway, New York 19, N. Y.

Reminder!

The 1952 Annual Conference of the National Society for the Prevention of Blindness will be held in Pittsburgh, March 19, 20, and 21. Make reservations directly with the Hotel Schenley. Some of the topics to be considered at the meetings are: "Children's Eye Problems," including discussion on (1) preschool vision testing, (2) environment and eyesight, (3) correction of squint, and (4) school administrators' responsibilities for eye health; "Medical and Scientific Research" on: (1) ACTH and cortisone, (2) retrolental fibroplasia, (3) hereditary eye problems, (4) congenital glaucoma, and (5) relationship of clinical to fundamental research; "Industrial Sight Conservation"; and "Eye Problems of Middle Life": (1) diabetic eye infections, (2) glaucoma, (3) fundus changes with age, and (4) the patient's reaction. Working conferences will be held for public health nurses, teachers of the partially seeing, and social workers. Meetings and exhibits will be held at the Mellon Institute. For further details keep in touch with the National Society for the Prevention of Blindness.

Leslie Dana Medal Awarded

Edward V. L. Brown, M.D., of Chicago is the 1951 winner of the Leslie Dana Medal, given annually for outstanding achievement in preventing blindness. Dr. Brown, a member of the Board of Editors of THE SIGHT-SAVING REVIEW, is senior attending ophthalmologist at Presbyterian Hospital, Chicago. He was selected for recognition by the Association for Research in Ophthalmology after being recommended by the National Society.

The medal was presented to Dr. Brown by the St. Louis Society for the Blind at a dinner in the Hotel Chase, St. Louis, on December 7. The National Society was represented by Mrs. Ruby M. Hopkins, field service consultant.

Society's Social Work Program

The National Society for the Prevention of Blindness has appointed Miss Julia G. Hurst as consultant in medical social work. Miss Hurst was

formerly medical social consultant, Division of the Physically Handicapped, Department of Health, New York City, and most recently director, Counseling Service, United Hospital Fund. She brings a rich background of experience to medical social work phases of the Society's expanding campaign to save sight.

Vision Test Mandatory for Drivers

All drivers wishing to renew their licenses and new applicants for licenses are required to pass the Ortho-Rater vision test, it was announced by the North Carolina State Department of Motor Vehicles. The Department recently installed 100 of the machines which have been widely used in industry and this is believed to be the first instance of their use for testing eyesight of drivers. N. C. drivers are required to renew their licenses every four years. Mandatory Ortho-Rater tests for these drivers and new applicants will result in about 1,500,000 vision tests every four years. The minimum standard for granting a license is 20/40 each eye separately and 20/30 for a one-eyed applicant. Advisors to the Department include an ophthalmologist and an optometrist, who believe this a constructive, forward-looking program to eliminate unnecessary accidents.

In Florida applicants for driver's licenses must pass vision tests on the Sight-Screener, a binocular testing instrument. These machines are used by the Florida State Department of Public Safety to test visual acuity in each eye separately and both eyes together. They also test depth perception and tell whether the applicant can distinguish colors and shapes of highway signs. It is being used with the standard Snellen chart; those failing the Snellen test are checked on the Sight-Screener and, if necessary, referred to eye doctors. When the applicant returns he must be able to see 20/60 with correction before he can get a driver's license. All below this standard are rejected, although some drivers with poor vision are permitted to drive in the daytime only if the eye doctor so advises.

Dr. Bailey Appointed Director

Pearce Bailey, M.D., has been appointed director of the National Institute of Neurological Diseases and Blindness, the new institute established last summer by an Act of Congress as one of the National Institutes of Health. Dr. Bailey has initiated a research program on neurological and sensory disorders for which science has not found all the causes or cures, which includes glaucoma and cataracts. Studies have been begun on the reproduction of retrolental fibroplasia in newborn and premature animals, physiology of the visual system, the physiopathology of the cornea and corneal grafts, and development of the human visual pathways.

Although the Institute was authorized by Public Law 692 and officially established November 22, 1950, it had neither funds nor staff until the fiscal year 1952. At that time research projects in neurology and blindness were transferred to the new Institute.

Highlights of Academy Meeting

Frederick C. Cordes, M.D., San Francisco, who is co-chairman of the National Society's California profes-

sional advisory committee, was named president-elect of the American Academy for Ophthalmology and Otolaryngology at the annual session in Chicago. Three vice-presidents were also elected: Drs. Georgiana Dvorak-Theobald, of Oak Park, Illinois; Percy E. Ireland, Toronto, Canada, and John S. McGavic, of Bryn Mawr, Pennsylvania. Dr. William L. Benedict, Rochester, Minnesota, was re-elected Executive Secretary-Treasurer. Presidents of the Academy are elected a year in advance and take office on January 1 following the annual meeting. The incoming president will be Dr. James Milton Robb, Detroit, who assumes the office on January 1, 1952; Dr. Cordes becomes president on January 1, 1953.

Speaking at the opening session, Derrick Vail, M.D., president of the A.A.O.O., discussed the subject of "Military Ophthalmology." Dr. Vail, who served in the European theatre in the recent war, said in part:

"World War II revealed the major role that eyesight often plays in offense and defense, in strategy and in tactics, behind a desk or behind a machine gun, in the air, on the sea or on land, in all forms of atmospheric conditions from gloom and darkness to intense sunlight and glare, in fog, mist, rain, snow or sleet. For several years after the war had begun, our leaders in the medical departments of the armed services were scarcely aware of the importance of eyesight and of ophthalmology in general. . . .

"It is estimated that 18 per cent of the service people wore glasses. Roughly figured, this means that 3,960,000 men and women were given at least two pairs of spectacles by our government. It is my estimate that more than 50 per cent of these individuals had at one time or another more than two pairs given them, and many had at least a dozen pairs. I despair of trying to figure the cost to the taxpayers of our country of these spectacles at $1.50 a pair."

Most of these difficulties could have been avoided, Dr. Vail said, if a skilled and experienced ophthalmologist had been included in the medical planning in the first years of war preparations. Eventually a consultant in ophthalmology was appointed in the Office of the Surgeon General of the Army and the errors were corrected. At present, however, there is no such officer anywhere, Dr. Vail declared, nor, so far as he knew, any recognition of the need for him.

Dr. Vail pointed out that although certain members of the armed forces need sharp and accurate eyesight, the mass of soldiers do not. "Visual standards must be practical," he said, "in view of the tremendous manpower requirements of modern warfare. Shortly after the outbreak of any war the visual criteria have been reduced in every country. As fast as new skills and inventions are utilized for war, the necessary visual efficiency to apply these skills and use the new inventions has to be evaluated and proper standards instituted. Requirements can never be static."

To assure a high quality of eye care in the armed forces, Dr. Vail made several suggestions in addition to the major one that an experienced ophthalmologist be attached to the planning staffs. First, he urged, provision must be made for research. He pointed out that "laboratories for basic research in ophthalmology are needed by our universities and must be supported if basic knowledge, which cannot be predicted or directly purchased, is to be increased."

Research Study Club to Hold Convention

The Research Study Club of Los Angeles announces its twenty-first annual mid-winter postgraduate clinical convention in ophthalmology and otolaryngology, January 14 through 25, 1952. Guest speakers for the eye course, given the second week of the convention, will include Sir Stewart Duke-Elder, London, England and Meyer Wiener, M.D., Coronado, California. Duke-Elder will discuss all aspects of the glaucoma problem, while Dr. Wiener will present his course in surgery of the eye.

Mass Screening for Glaucoma Detection

Reporting at the June, 1951 meeting of the American Medical Association on their study of the glaucoma screening of 10,000 persons in industry, Solomon S. Brav, M.D., and Herbert P. Kirber, M.D., of Philadelphia, pointed out that two per cent of the general population have undiscovered glaucoma. They made the study in large industrial plants of 10,000 persons over the age of 40 and found that 84 definitely had glaucoma, 69 early glaucoma and 71 were borderline cases, a total of 224 or 2.24 per cent. An additional 100 were kept under further observation. Doctors Brav and Kirber suggested that the majority of the population could be reached by making an eye test part of routine physical examinations in industry, or by creating a specialized agency to devise methods of mass testing.

Sunglasses Double as "Snow-Glasses"

"The beach is not the only place where sunglasses are needed. Out-of-door sports are damaging to the sensitivity of the eye when no sunglasses are worn. Skating and skiing are especially bad," says Dr. Robert H. Peckham, writing in a recent issue of *Today's Health*, published by the American Medical Association. Dr. Peckham and others of the Army-Navy Vision Committee made night vision tests among servicemen during World War II which revealed the damaging effects of exposure to snow-glare.

Otis Extends Eye Protection Program

The Otis Elevator Company recently extended its eye protection program to include field employees engaged in the construction and installation of elevators and maintenance and service work involved in elevator operation. Announced company policy includes availability of spectacle type prescription and non-prescription goggles to all outside employees who may be exposed to eye injuries, and prescription spectacle type goggles without charge to all outside employees who require corrective glasses and are engaged in work exposing them to eye injuries.

Schoenberg Glaucoma Prize Awarded

Adolph Posner, M.D., and Abraham Schlossman, M.D., both of New York City, were awarded the Schoenberg Glaucoma Prize for their paper, "Studies in Glaucoma with Emphasis on Its Early Recognition," an analysis of the discovery and treatment of 474 cases of glaucoma. The award was presented by Franklin M. Foote, M.D., executive director of the National

Society for the Prevention of Blindness, at a meeting of the New York Society for Clinical Ophthalmology, held at the New York Academy of Medicine. The prize, a cash award of $500, was established in honor of the late Dr. Mark J. Schoenberg, who early pioneered with the Society in its campaign to prevent blindness from glaucoma.

Increase in Hereditary Glaucoma

A survey at the Canadian National Institute for the Blind showed hereditary glaucoma in 17.8 per cent of patients having glaucoma, said Lloyd A. Probert, M.D., Toronto, in a paper presented at the annual meeting of the Canadian Medical Association in Montreal. He said that this figure indicates that hereditary glaucoma is not so rare as was thought. Patients who had surgery became blind in about the same length of time as a like number who had no surgery.

A.M.A. Supports Bill Banning Sale of Fireworks

A statement filed in Chicago by the American Medical Association with the House Judiciary Committee supports its bills restricting sales of fireworks. The statement says in part that the medical profession "has been concerned with the serious menace to life and health resulting from the use of fireworks," and that the A.M.A. favors such bills as those under consideration, "which are designed to alleviate health hazards of this type."

The bills would prohibit shipment of fireworks into any state or political subdivision which prohibits their sale, unless intended for public displays or other purposes specifically authorized by law.

Current Articles of Interest

The Eyegrounds of Toxemia in Pregnancy, H. W. Hawn, *The Journal Lancet,* August, 1951, Vol. LXXI, No. 8, pp. 333–334.

There has been a marked reduction in incidence of ophthalmoscopic signs of this condition thanks to early recognition of impending toxemia in pregnancy. In the majority of patients with early toxemia the only positive sign in the eyegrounds is generalized or focal arteriolar narrowing, which is a blood vessel constriction confined to only a small segment of the arteriole. In conclusion, the author says that early recognition of toxemia in pregnancy, before the onset of irreversible changes, is all-important and that ophthalmoscopic examination of the eyegrounds is useful especially when early symptoms are present.

Metabolism of the Cornea and Lens During Embryonal Life, M. de Fincentiis and G. Auricchio, *Rass. Ital. d'Otal.*, March–April, 1951, Vol. XX, Nos. 3–4, p. 69.

The authors studied the modifications of metabolism of the cornea and lens of the chick during embryonal and postnatal life. In both of these tissues they conclude that respiration decreases from the twelfth day of incubation to birth. The changes occurred more rapidly and in a higher degree in the lens than in the cornea. Glycolysis diminished slowly up to the fourteenth day, maintaining successively a value sufficiently constant to the end of embryonic life. Respiration and glycolysis are definitely more elevated in the first days of life than in the adult stage.

EUGENE M. BLAKE, M.D.

The Effect of Available Residual Chlorine and Hydrogen-Ion Concentration Upon the Eyes of Swimmers, E. W. Mood, C. C. Clarke, and A. Gelperin, *American Journal of Hygiene,* July, 1951, Vol. 54, No. 1, pp. 144–149.

After studying the eyes of swimmers, the authors found that in the 24-hour period following swimming, irritation is less when hydrogen-ion concentration is at a *p*H of 8.0 than at 7.0; irritation increases slightly when the total available residual chlorine is increased from 0.05 to 0.50 p.p.m.; and the hydrogen-ion concentration in the range of *p*H 7.0 to 8.0 has a greater effect on eye irritation than does total available residual chlorine between concentrations of 0.05 p.p.m. and 0.50 p.p.m. Degree of irritation was measured subjectively by the eye sensations experienced by swimmers after swimming; and objectively by the changes observed when looking at the eye immediately before and after swimming.

Eye Injuries of Boxers, A. Favory and J. Sédan, *Archives d'Ophtalmologie,* Vol. 11, No. 5, 1951, pp. 429–456.

The authors indicate that some boxers have a greater eye aptitude for boxing than others, and describe some of the eye conditions which can occur as a result of boxing. They point out the rarity of cataract and glaucoma among boxers and the relatively higher frequency of retinal hemorrhages, which may be one of the causes of retinal detachment. This latter condition occurs especially in boxers who have previously had lesions of the retina. Necessary protective measures are presented and rules are suggested for determining ocular aptitude for boxing. Various therapeutic measures are described.

Characteristics of the Refractive State of the Normal Human Eye, J. N. Evans, *The Brooklyn Hospital Journal,* Vol. IX, January–March, 1951, pp. 4–38.

The author concludes, in part, that no study of the refractive error without associated pathologic findings is adequate without familiarity with the subject's physical health. Other points he makes are that refractive errors are (1) physiologic variations and as such cannot be treated as disease entities; (2) they follow a predictable and characteristic curve of change known as the "norms of refraction"; (3) they are not modifiable by use or abuse and hence are not "curable" by the use of glasses, nor are they modified by "wrong" glasses or eyestrain; (4) "exercise" or other forms of training cannot modify the refractive curve; (5) refractive errors are inherited; (6) myopia and hyperopia are only normal relative variations of the refractive state; and (7) the term "anomalies of refraction" as applied to refractive errors, arises from defective nomenclature.

Visual Results of Cataract Extraction, G. De Ocampo, *Bulletin of the Philippine Ophthalmological and Otolaryngological Society,* March, 1951, Vol. III, No. 2, pp. 2–3.

Visual results of 300 cases out of 515 consecutive cataract extractions are summarized. In uncomplicated cataract extraction, 89.5 per cent had vision of 20/20 to 20/30, while 95.3 per cent had 20/20 to 20/50. In complicated cataract extraction, 27.6 per cent had 20/20 to 20/30 vision, while 53.8 per cent had 20/20 to 20/50. Of the uncomplicated and complicated extractions, 72.5 per cent had 20/20 to 20/30 vision, while 83.9 per cent had 20/20 to 20/50. In senile cataract with diabetes mellitus, 55.6 per cent had 20/20 to 20/30 vision while 81.4 per cent had 20/20 to 20/50. Results were generally poor in cataracts with concomitant or causative, controlled or uncontrolled glaucoma. Only one third had vision of 20/20 to 20/50.

The Development of Cataract in High Myopia, G. Auricchio, *Rass. Ital. d'Ottal.,* January–February, 1951, Vol. XX, Nos. 1–2, p. 8.

The author made a statistical biomicroscopic study of the morphology of the lens in cases of myopia above 10 diopters, correlating the findings with the age of the patient. He concludes that there is in myopia a state of dystrophy of the lens fibers which results in an increased percentage of loss of transparency. These changes, however, appear relatively late and are secondary to alterations

of the choroid and retina, especially the former, since this membrane determines the chemical composition and the physio-chemical structure of the endocular fluid and thus indirectly influences the processes of nutrition of the lens.

EUGENE M. BLAKE, M.D.

Antihistaminics, Their Role in Ophthalmology, G. S. Atkinson, *Medical Times*, July, 1951, Vol. 79, No. 7, pp. 415–418.

The treatment of allergic conditions with antihistaminic drugs does not cure the patient but only relieves his symptoms. There is a wide field for their use in such external diseases of the eye and its adnexa as allergic dermatitis, blepharitis, marginal keratitis with ulcer, superficial keratitis, conjunctivitis, vernal catarrh and recurrent erosions, all of which react favorably in a high percentage of cases to local application of antihistaminics. They are also of value in treating uveitis, at least in the nongranulomatous type, and possibly in other intraocular diseases.

Cortisone in Ophthalmology, H. Arruga, *Archivos de la Sociedad Oftalmológica Hispano Americana*, June, 1951.

The author presents 61 of his own cases, stating that results with ACTH and cortisone were good in acute inflammatory affections of the eyeball and in acute phases of chronic ones, particularly those of allergic nature. Results were less satisfactory in subacute infections and poor in severe infections and affections by viruses. In conjunctival and superficial corneal affections the author favors instillations of collyrium or application of ointment every two hours. In deep corneal affections and in those of the anterior segment, he uses a 0.1 c.c. subconjunctival injection of the original solution every two days, and instillations or ointment three times a day. He uses retrobulbar injections in posterior segment and optic nerve affections. Occasionally in severe cases, parenteral administration is used. In some patients aspirin and "irgapirine" aid the action of cortisone.

Cortisone Therapy in Ophthalmic Diseases, F. Schwarz, *Kresge Eye Institute Bulletin*, February, 1951, Vol. 2, No. 3, pp. 59–61.

An unselected series of various ocular conditions in which cortisone was used is presented. In a group of over 100 patients there were only three untoward reactions. Cortisone's most valuable role in ophthalmology is that of stopgap medication which gives the ophthalmologist an opportunity to institute time-tested methods of therapy and by its action prevents the formation of scars and degenerative lesions. If it is remembered that it is a valuable drug which is also potentially dangerous, and if the physiological limitations of the drug are kept in mind, it is probably the most valuable adjunct to ophthalmic therapy in recent years.

Herpes Zoster Ophthalmicus Successfully Treated with Aureomycin, Lieutenant Colonel Tibor Benedek, Med. Res., *The Military Surgeon*, June, 1951, Vol. 108, No. 6, pp. 491–494.

In the past in ophthalmic herpes zoster, ptosis of the upper eyelid, involvement of the external and internal ocular muscles and permanent corneal damage endangered eyesight and may

have caused blindness, there being no remedy to halt the viral process. Now, antibiotics are directed against this dangerous viral infection. The author treated successfully a severe case of this disease, using 250 mg. aureomycin four times daily, continued for four days after resolution of the condition to prevent recurrence. The total amount given was 10 gms. in 10 days. Postherpetic neuralgia was not controlled by the antibiotic.

Aureomycin as Prophylaxis Against Ophthalmia Neonatorum, S. G. Clark and A. M. Culler, *American Journal of Ophthalmology*, June, 1951, Vol. 34, No. 6, pp. 840–846.

As prophylaxis against ophthalmia neonatorum, one group of 442 newborn were given one per cent silver nitrate and another group of 1,000 infants were given a single instillation of 0.5 per cent solution of aureomycin borate. Silver nitrate caused an immediate reaction of purulent discharge, redness, and swelling in about 20 per cent of the infants. This reaction subsided without treatment and without permanent deleterious effects. There is probably less reaction if freshly prepared, nearly neutral silver nitrate is used, followed by irrigation with normal saline. No such reaction followed prophylaxis with aureomycin. The eyes of infants seem particularly susceptible to pyogenic infection, its incidence comparable in the two groups. The authors state that no conclusions as to the efficiency of aureomycin as a prophylaxis can be drawn from this series and that only a large experience would justify modification of existing state laws. They believe that dispensing aureomycin or penicillin to the mother for use in cleansing the infant's eyes during the first few weeks of life would contribute more toward reducing the incidence of purulent infection than making a change in the drug used for initial prophylaxis.

The General Clinical Study in Glaucoma, B. Courtis and R. B. Nuñes, *Ophthalmologia Ibero Americana*, 1950, Vol. XII, No. 4, pp. 357–363.

After studying 120 glaucoma patients, the authors report the following findings:

1. From the clinical examination the importance of the emotional factor, the menopause and the menstrual cycle is emphasized. The presence of general vascular disturbances in 33 per cent, of allergic diseases in 14 per cent, of rheumatism in 40 per cent, and of hepatic disturbances in 43 per cent of the cases is demonstrated.

2. The laboratory tests show: (a) that hydremia is increased in 31 per cent, decreased in 10 per cent and normal in 58 per cent; (b) that the biliary function of the liver is impaired in 55 per cent of cases, the glycogenic function in 25 per cent, the antitoxic function in 40 per cent, and cholesterol metabolism is impaired in 34 per cent of cases; (c) there is a tendency towards alkalosis in 30 per cent of the glaucomas; and (d) the blood count, the hemogram, erythro-sedimentation and calcemia are normal.

Comments on the Campaign Against Trachoma in the French Colonies and Zones of Influence in Africa, P. Bailliart, *Revue Internationale du Trachome*, No. 2, Année 1951, pp. 196–201.

Dr. Bailliart reviews the most recent reports on the incidence of tra-

choma in Algeria, Tunisia and Morocco; and points out that the disease is currently spreading southward particularly towards Togo, the Gold Coast, Ivory Coast and Cameroun. The principal invasion routes of the disease are the highways along which the Moors from the north carry the infection. Dr. Bailliart recommends strict control in Madagascar and creation of an anti-trachoma center in Bamako.

Early Signs of Trachoma Observed by the Slit Lamp, Y. Ito and C.-H. Yu (Japan), *British Journal of Ophthalmology*, May, 1951, Vol. XXXV, No. 5, pp. 304–305.

From observations through the slit lamp, the authors discovered clinically the first sign of trachoma on the bulbar conjunctiva in 400 trachomatous eyes at different stages; 20 eyes with normal conjunctiva; and 58 eyes with epizoötic (widely diffused and rapidly spreading) conjunctivitis. Stating that this finding has not been reported previously, the authors believe these observations valuable to those called upon to diagnose the earliest stage of trachoma, from which the normal conjunctiva and every variety of epizoötic conjunctivitis are distinctly differentiated.

Present Concept of Primary Glaucoma, G. Kluzer and P. Matteucci, *Rass. Ital. d'Otal.*, March–April, 1951, Vol. XX, Nos. 3–4, p. 83.

Prefrontal lobotomy, performed upon 7 psychopathic patients and 2 of stubborn trigeminal neuralgia produced immediate reduction of intraocular tension. Such decrease remained controlled for various lengths of time, even when the arterial pressure, after an initial fall, had returned to its original value. The behavior was similar in cases of uni- and bilateral lobotomy. The second operation did not induce a new modification of tension. There was frequent confirmation of preexisting psychic trauma.

The observations made gave evidence of functional diencephalic alterations in many glaucomatous patients. The experiments conducted for the first time in man seem to confirm the existence of cortical vasomotor centers, attesting particularly the influence of cortical centers in ocular tension. The constant vascular alterations of the glaucomatous are strictly related to nervous factors, which of themselves are, however, not sufficient to explain all of glaucoma.

The authors conclude the acceptability of the concept of a "central nervous factor" in the regulation of the ocular tension and in the pathogenesis of glaucoma. The existence of cortical and diencephalic centers of the control tonus is regarded as a function more complex, which, analogous to other vegetative functions, is dependent upon the action of numerous centers, whether central (cortical, diencephalic, bulbar or medullary) or of peripheral (cervical sympathetic, carotid sinus, parasympathetic ganglia).

EUGENE M. BLAKE, M.D.

Sight Saving, R. E. Jewett, *Monthly Bulletin*, Indiana State Board of Health, April, 1951, Vol. LIV, No. 4, p. 75.

The author presents the problems of prevention of blindness and sight conservation in children by describing the programs of Indiana's numerous

agencies, which are seeking to meet these problems. He indicates that the combined resources of all agencies, applied fully, would largely fill the needs, but these resources are not so applied in every instance. Specific needs include more vision testing of preschool and school children, better lighting in schools, and better case finding and reporting of visual defects.

Between Eyes and Danger, S. C. Herbine, *National Safety News*, July, 1951, Vol. 63, No. 7, p. 28.

Eye injuries in 1941 cost $20,000,000 in direct compensation costs. Since then industrial eye accident costs have gone up as high as 78.5 per cent. Although the need for industrial eye protection is recognized, it is sometimes difficult to focus the need in a plant and get a program into practice. The author presents the following steps to be followed in setting up a program: (1) determine the need in your plant through a check of safety practices and a survey of jobs and protection needed; (2) sell the idea to management; and (3) make the program work by putting responsibility where it belongs and developing proper attitudes among workers.

Why We Should Analyze the Industrial Lighting Problem, L. C. Butler, *Illuminating Engineering*, August, 1951, Vol. XLVI, No. 8, pp. 403–404.

Quantitative and qualitative evaluation of the illumination need for different operations should be computed on the basis of eye comfort in seeing the work. Precision in lighting the task is as essential to efficient performance as precision tools and machinery. Plant managements should therefore agree to scientific analyses by experts of their lighting needs. The lighting engineer should thoroughly explore this phase of lighting the industrial plant where maximal seeing is so important to safety, health, morale, and efficient production.

Eye Safety Pays for Itself, *Safety, Maintenance & Production*, May, 1951, Vol. 101, No. 5, pp. 22–24.

Accompanying charts show the results of an eye protection program in the shops of a leading railroad, bringing out the following points: (1) eye protection programs are effective, particularly when compulsory; (2) they actually save the company money; and (3) they achieve their goal—to protect the worker's eyesight and, in turn, his productive capacity.

Economics of Industrial Ophthalmology, I. H. Stolzar, *The Ohio State Medical Journal*, July, 1951, Vol. 47, No. 7, pp. 654–656.

A report released by the Division of Safety and Hygiene of the Industrial Commission of Ohio for 1949 revealed that of a total of 271,156 claims filed, 51,924 claims (19.1 per cent) were for eye injuries. The author suggests a minimum program for industrial visual hygiene, which includes ophthalmological examination; vision test and record; visual standardization for job selection; and prophylactic and corrective measures. He believes the industrial physician is obligated to advise as to proper utilization of visual skills and to reduce eye accidents as a means of conserving manpower.

Book Reviews

SURGERY OF CATARACT. Daniel B. Kirby, M.D., L.L.D. Philadelphia: J. B. Lippincott Co., 1950. 695 p. Ill. $30.00.

This book by the former professor and chairman of the department of ophthalmology of New York University—Bellevue Medical College is one of the outstanding contributions to ophthalmic literature of the past decade. It ranks ahead of most works of this nature and is the most complete study of cataract presented up to the present time. The author, with his characteristic modesty, speaking of the "preparation of this monograph on the surgery of cataract," is guilty of considerable understatement. The book begins with an elaborate historical review, from 1000 B.C. to the present day, and gives in detail the surgical procedures of the masters of each era. In addition to his rich, satisfactory and extensive experience, Dr. Kirby has made generous use of material furnished by his contemporaries. This excellent method of presenting the subject increases the value of the book to the point where few other references on cataract are needed by the student or the scholar.

The text is well arranged and contains many unpublished personal observations of experts in the field of cataract surgery. The author presents considerable discussion on the preparation of the surgeon and the preparation of the patient. This portion of the book is well flavored with valuable personal experience, and is very important for the neophyte and the older surgeon.

Doctor Kirby's observations on "The Training of Cataract Surgeons" are excellent, indicating that "inasmuch as the cataract operation represents in its best form the acme of eye surgery, it will be admitted that the surgeon who can do the cataract extraction well also can do other intraocular surgery well. The neophyte is best introduced to cataract surgery by a study of anatomy, particularly as applied to surgical conditions, and he will do well to learn normal, as well as abnormal, conditions of animal and human cadaver eyes by dissection and by microscopic examination. . . . He should understand his obligation to the patient and the privilege it is for him to be permitted to do cataract surgery. He should see demonstrations, practice and gain experience on animal and cadaver eyes. . . . He should have didactic instruction, illustrated preferably by motion pictures in color of actual operations. . . . Finally, he should be trained as an assistant at actual human eye surgery and should progress to doing surgery himself—first under guidance and then on his own responsibility."

In a word, Dr. Kirby's recommendations for training are in accord with the standards set by the American

Board of Ophthalmology, in whose establishment he took an active part.

The illustrations in this volume are profuse and excellent. Although the author did not follow his original plan completely, many of the drawings are inverted. This arrangement is convenient for the reader, in that he does not have to turn the book to view the operation from the surgeon's angle. He undoubtedly had some difficulty convincing the publishers of the advantages of inverted drawings but the idea is original and definitely good.

Kirby's *Surgery of Cataract* is an excellent, authoritative book which should be read and not put on the shelf and forgotten.

BRITTAIN F. PAYNE, M.D.

GENETICS IN OPHTHALMOLOGY. Arnold Sorsby, M.D., F.R.C.S. London: Butterworth & Company, Ltd., St. Louis: The C. V. Mosby Co., 1951. 251 p., with subject index. $9.50.

Aside from the monumental monograph by Julia Bell in *The Treasury of Human Inheritance*, the only texts on ophthalmologic genetics up to the present have been those by Waardenburg and by Franceschetti, both written in the German language and hence not readily accessible to most English-speaking ophthalmologists.

Sorsby has rendered a most valuable service in publishing this modern, compact and lucidly written book dealing with a phase of ophthalmology which is rapidly gaining in importance, even for the practical clinician.

The reasons for the need of such genetic knowledge are twofold. First, great strides have recently been made by geneticists in demonstrating the hereditary basis for many metabolic diseases, even those which occur late in life. Second, through the recent advances made in prophylactic, hygienic and therapeutic measures, the infectious diseases have been so well controlled that the degenerative, biotrophic and metabolic diseases have come to assume an unprecedented prominence in ophthalmology. Such diseases as cataract, glaucoma and strabismus have unequivocally been shown to have a hereditary basis; and their proper management depends to a large extent on familiarity with the genetic factors involved. Such knowledge should not have the effect of turning the clinician into a fatalist or a therapeutic nihilist, for environmental factors still exert a definite modifying influence on the genetically determined patterns.

To cite a non-ophthalmologic illustration of the modifying effect of environment: The Russian rabbit is white, except for a black snout and black paws and ears. If the hair of the back is shaved off, it will grow back white in warm climate, but black in cold climate, thus showing that the black color has developed in the peripheral parts as a result of environment, even though the rabbit is genetically white.

In the first section of the book, the author surveys in a popular and interesting style the entire range of theoretical genetics.

The subsequent chapters are devoted to a well-illustrated account of the various hereditary eye diseases. Particularly interesting are the chapters dealing with the abiotrophics and hereditary syndromes in which the author has done outstanding original research.

ADOLPH POSNER, M.D.
New York, N. Y.

OCULAR TOXOPLASMOSIS. Michael J. Hogan, M.D. New York: Columbia University Press, 1951. 86 p. $2.75.

This monograph reviews pertinent literature on toxoplasmosis, emphasizing ocular aspects; discusses recent opinions on the proper laboratory diagnosis and interpretation of laboratory tests in toxoplasmosis; indicates results of serologic studies on patients with uveitis and in normal individuals; describes characteristics of the lesions in the eyes of laboratory animals with experimental toxoplasmosis; and presents the effect of a number of drugs and antibiotics against experimental toxoplasmosis.

The author points out that toxoplasmic chorioretinitis and associated ocular changes are valuable diagnostic signs of congenital toxoplasmosis. The cases of 126 patients with iridocyclitis or chorioretinitis who were examined for toxoplasmosis are discussed and 5 cases of congenital toxoplasmosis with chorioretinitis are reported. Findings in the eyes of rabbits with experimental toxoplasmosis are presented.

The laboratory and clinical studies were made possible principally by a grant from the Research Study Club of Los Angeles, California, and a grant from the Snyder Ophthalmic Foundation aided in the completion of the work.

EYE SURGERY. H. B. Stallard, M.D., F.R.C.S. Baltimore: The Williams and Wilkins Company, Second Edition, 1950. 667 p. Ill. $9.50.

This second edition of Stallard's *Eye Surgery* will prove even more popular than the first edition with ophthalmologists, for whom it is designed. The author has made many changes, enlarging the text by 200 pages, and has revised and brought up to date the various aspects of eye surgery including plastic eye surgery, which in the first edition was preponderously weighted with material based on war experience. Bringing to the book the benefit of the years of his postwar experience, Dr. Stallard presents a text of greater and more practical value to his readers. The volume is printed in good, legible type, well illustrated (550 illustrations), and is written in clear, concise style.

A NEW SELECTED BIBLIOGRAPHY OF LITERATURE ON THE PARTIALLY SEEING. Lorraine Galisdorfer. Kenmore, New York: Lorraine Galisdorfer, 1951, 120 p. $1.50.

The author, who is a teacher of partially seeing children, is recognized as being among the most active in providing, for all such teachers, basic information on various aspects of the education of the partially seeing. The present paper-bound volume is limited chiefly to the literature published in the past 25 years, and pertains solely to the seriously visually handicapped but not blind. The topics are divided into three broad classifications: (1) the field of sight conservation; (2) the health of the partially seeing; and (3) the educational and vocational guidance of the partially sighted. The last 13 pages are devoted to a listing of publishers of periodicals containing material on the partially seeing, and to the author index.

Not only teachers but everyone concerned with partially seeing children will find this exhaustive bibliography a useful guide.

EDUCATIONAL READING GUIDE FOR THE PARTIALLY SEEING CHILD. Lorraine Galisdorfer. Buffalo: Foster & Stewart Publishing Corp., 1951. 83 p. $1.50.

Everyone working directly or indirectly with partially seeing children will find this compilation an invaluable reference guide. It is the only publication currently available that lists and annotates all types of reading matter printed in large type for children, according to age and grade levels. The index, which facilitates the finding of desired materials, contains the following categories: Books for Nursery and Kindergarten Children; First Picture-Story Books; Intermediate Picture-Story Books; Fairy Tales, Folk Tales, Poetry, and Plays; Social Studies and Informational Books; Language and Spelling Books; Health, Safety, and Science Books; Basic Readers; Arithmetic Books; Reference and Measurement Materials; Names and Addresses of Publishers; Author Index. This compact, definitive product of Miss Galisdorfer's practical research over the years is a major contribution to the education of partially seeing children.

M. A. C. Y.

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